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COMMUNICATIONS

THE VISCOUS-ELASTIC PROPERTIES OF THE VITREOUS BODY AND ITS REACTION TO EXTERNAL FORCES

BY

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IN those clinical conditions wherein the behaviour of the vitreous body is of importance—its break-down into a fluid state in inflammatory or degenerative conditions, its swelling in glaucoma, and so on—an accurate measurement of the consistence of its structure is essential if any progress is to be made in the elucidation of the physical changes which determine its conduct. Morever, if it is to be suggested that traction by the vitreous upon a weakened area of the retina may in some cases play a determining part in the aetiology of detachment of the retina, the nature and extent of the force which the vitreous gel is capable of instituting, becomes of considerable interest. It would seem, therefore, that a study of the viscous and elastic properties of the gel is not without importance; and, incidentally, it has proved of interest in so far as it confirms the conclusions published by one of us three years ago (Duke-Elder, 1930) with regard to the intimate physical structure of the vitreous body and its affinity to other gels, such as gelatine.

The very small rigidity of the vitreous body, and the ease with which its structure is broken down by mechanical stresses, make ordinary methods inapplicable to the study of its elastic properties. The work of Lobeck (1929) and Baurmann (1929), in whose experiments external force was applied to the gel, should be interpreted in this sense, for *in vitro* the gel breaks down if subjected to pressures as low as 1 or 2 mm. of water, a phenomenon which occurs if it is merely left unsupported in mass for any length of time. This inability to maintain its physical gel structure when forces are applied to it makes a study of the reaction of the vitreous to forces difficult, but a suitable method was found in a modification of that used by Freundlich and Seifriz (1923-4) in their work on inorganic gels. The essential principle of the method is to introduce a nickel particle into the body of the gel and subject this particle to the force exerted by an electro-magnet; the extent of the excursion of the particle in the field of force, and its recoil when the force is removed gives a measure of the viscosity of the gel, the degree of its consistence, and its elasticity.

The technique finally adopted was as follows:—A small mass of vitreous was introduced with full aseptic precautions into a glass cell made from a piece of glass tubing, 6 mm. long and 10 mm. in diameter, ground square at the ends and cemented to a microscope slide. It could be closed on the top by means of a cover-slip, and made air-tight with vaseline to prevent contamination or evaporation. This was clipped to the stage of a microscope fitted with a Leitz micrometer eye-piece, in which the cross-hair was moved by a screw, bearing a drum divided into 100 divisions. Calibration with a Zeiss object-micrometer showed that, using an objective of 16 mm., one division on the drum was equivalent to $0{\cdot}472 \pm 0{\cdot}001\mu$. The nickel particle was introduced into the mass of vitreous by means of a micromanipulator of the ordinary pattern, made to clamp on to the stage of the microscope; three screws gave movements in three directions at right angles, and several coarse adjustments were also provided. The magnet consisted of an iron core, 54 cm. long and 25 mm. in diameter, on which was wound a coil of No. 24 S.W.G. enamelled copper wire, to a resistance of 280 w. The coil was connected, through a rheostat, ammeter and switch, to the 200 volt D.C. mains. To the end of the magnet core was screwed a horizontal iron rod, 5 cm. long and 6 mm. in diameter.

Some of Kahlbaum's pure nickel powder was placed on a microscope slide and distributed by tapping, the excess being shaken off. The slide was placed on the microscope stage, a particle about 50μ in diameter and as nearly spherical as possible being brought to the centre of the field. The needle in the micromanipulator was then dipped in glycerine and slowly withdrawn and then

its point was brought fairly close to the particle selected. Under the microscope the needle was lowered so that its point touched the top of the particle, and then raised, when the particle usually adhered to the point.

In the introduction of the nickel particle into the vitreous, if the needle with the particle were merely immersed in the gel it was found that the particle did not normally come away from the needle in the gel, and, moverover, that the withdrawal of the needle caused a considerable disturbance, often lifting the mass of vitreous bodily out the cell. The micromanipulator was, therefore, employed merely to place the particle on the surface of the gel. The cell was then closed with a cover-glass and placed on the top of the field magnet of a string galvanometer, so that its centre was just over the gap beween the poles. The current was switched on, and after about an hour, the particle was found to have penetrated 1 or 2 mm. below the surface.

After the particle had been introduced it was necessary to wait for an hour or two for the system to attain equilibrium. The cell was then placed on the microscope stage and arranged so that one edge of the particle was seen to coincide with the zero mark of the micrometer eyepiece and measurements were made of the displacements produced on exciting the magnet.

When the end of the magnet was brought near to the cell and the current switched on, the particle could be seen to move, and to spring back towards its original position on switching off, thus showing that the gel possesses real elasticity. On the other hand, bringing the unexcited magnet near the cell produced no perceptible effect, showing that the residual magnetism of the core could be neglected. It was found, however, that, if the current was allowed to flow only for a very short time (*e.g.*, 1/5 second), displacements could be obtained which were completely and instantaneously reversible, but that, if the current were left on for any appreciably longer time, the return of the particle was, in general, incomplete. Both the reversible and the irreversible components of the displacements were found to increase with the time for which the current was allowed to flow, a typical set of results being shown in Table 1.

It is clear from these figures that the vitreous is not behaving like an ordinary elastic body, and it appears that its viscous properties must be taken into account. The fact also that displacement No. 6 differs so greatly from No. 1 shows also that the behaviour of the gel is dependent on its previous history.

In order to analyse the motion of the particle in the vitreous humour, arrangements were made for observing the position of the particle at known intervals of time after switching on the magnet. A typical example of the curves so obtained with cat's

vitreous is shown in Fig. 1. It will be seen that the curve is initially very steep indicating a rapid acceleration and an almost instantaneous displacement, but that it soon bends over, the final configuration being practically straight, corresponding to a uniform motion of the particle.

TABLE I—CAT'S VITREOUS

	Time for which magnet was excited.	Reversible Component.	Irreversible Component.
		Scale Division.	Scale Division.
1	10 seconds	14·1	0·0
2	30 seconds	14·7	1·0
3	1 minute	17·4	1·6
4	3 minutes	23·1	6·0
5	9 minutes	35·0	16·3
6	10 seconds	26·6	1·4

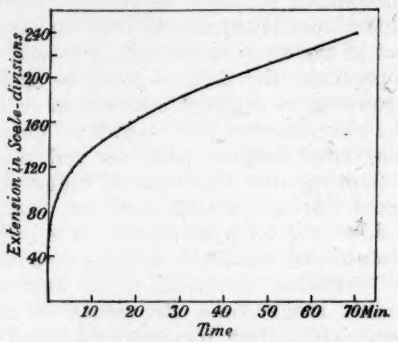

FIG. 1.

Vitreous humour from ox eyes appears to have much the same elastic properties as that obtained from cats, although it is definitely less rigid, and gives curves of a slightly different shape. Fig. 2*a* shows the time extension curve obtained with ox vitreous, the end of the magnet being at a distance of 15 mm. from the particle. Comparison with Fig. 1 (cat's vitreous, 8 mm.) will show that, although in the case of the ox vitreous the field was weaker, the displacement produced was much greater, while the curve in Fig. 2*a* bends over considerably more slowly than that in Fig. 1. The size of nickel particle was approximately the same in both

cases, and the current flowing in the magnet was identical, so that the experiments are comparable even if not quantitatively the same. The differences exhibited appear to be inherent ones, as the respective curves are not isolated examples, but typical of many experiments with different specimens.

A consideration of these time-extension curves is of considerable interest, and the two types of extension, the initial rapid movement and the subsequent slow "creep," find their counterpart

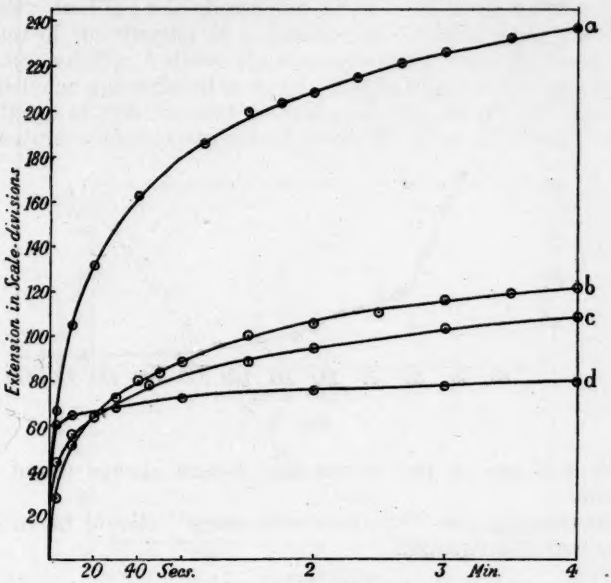

FIG. 2.

in the behaviour of other inorganic gels which, like the vitreous, are made up of minute fibrillar micellae suspended in and associated with a viscous fluid (*e.g.*, gelatine, Poole, 1925). The stretching of a gel system of this nature consisting of a network of elastic fibrils suspended in a viscous liquid should be made up of two components—an instantaneous extension due to the sudden stretching of the fibrils, followed by a slower creep, during which the intermicellar liquid readjusts its position by viscous flow.

If, instead of plotting a simple time-extension curve, a derived curve is obtained wherein increments of extension (dE/dT) are plotted against total extension (E), further interesting considerations arise. Such a derived curve from Fig. 1 is seen in Fig. 3;

it is straight over a considerable portion of its length, but later undergoes a sudden inflection, the remainder being curved, thereafter tending to become asymptotic to the E axis. The general form of these curves is very similar to that of Poole's curves for gelatine, the discrepancy shown by the first point being doubtless due to the fact that the system had not settled down to a steady state after the first instantaneous displacement. This discrepancy

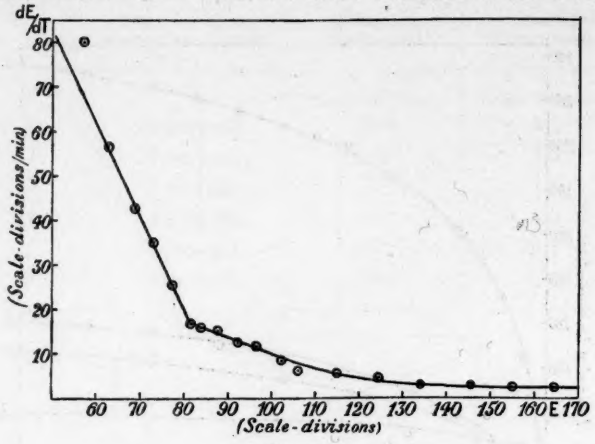

FIG. 3.

of the first one or two points was almost always found to be present.

Theoretically this "viscous-elastic creep" should be in accordance with the equation

$$K_1E+K_2\eta(dE/dT) = \text{constant} \qquad (1)$$

where

K_1 is a constant proportional to the elasticity of the fibrils.
K_2 is a factor depending on the nature of the channel through which flow can occur.
η is the coefficient of viscosity of the intermicellar liquid.
E is the total extension, and
T is the time taken to produce this extension.

Transposing (1) and differentiating with respect to E,

$$\frac{d(dE/dT)}{dE} = -\frac{K_1}{K_2\eta} \qquad (2)$$

In other words, the curve representing equation (1), with E and dE/dT as variables, should be a straight line, the slope of which

is inversely proportional to the viscosity of the liquid and to a factor depending on the nature of the flow-path, while being directly proportional to the modulus of elasticity of the fibrillae. Since neither the dispersion nor the viscosity should be affected by variation of the load, the slope of the curve of equation (1) should be independent of the load. The fact that the slope of the straight portion of the dE/dT—E curve is independent of the force acting on the particle was shown by carrying out successive experiments with the magnet at different distances from the particle. In Fig. 4 is shown the dE/dT—E curve obtained with the end of the magnet at a distance of 12 mm. from the nickel particle, and Fig. 5 shows the corresponding curve obtained when this distance was reduced to 8 mm. Neglecting the first two points, the slopes of the straight portions of two curves are found to be the same within experimental error, the value of d^2E/dT^2 being

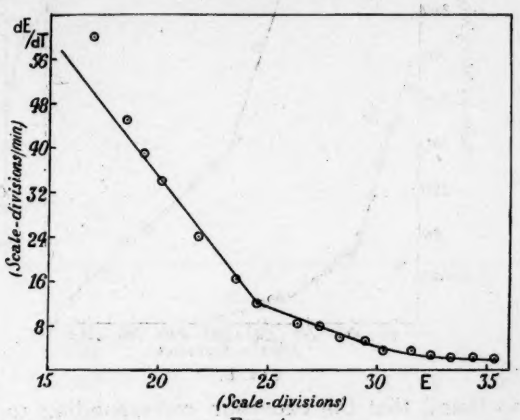

FIG. 4.

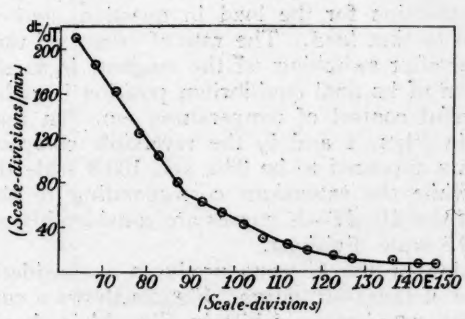

FIG. 5.

5·1 minutes. Fig. 6*a* shows the dE/dT curve derived from Fig. 2*a*, the slope of the straight portion is 6·1 minutes. Figs. 2*b* and 6*b* show the corresponding curves for v=20 mm.; in this case the straight portion of the derived curve had a slope of 6·8 minutes—the same within experimental error.

Up to this point, therefore, the displacement of the nickel particle in the vitreous appears to follow the same laws as the linear extension of gelatine and constitutes strong evidence in favour of the micellar theory of the structure of the vitreous gel.

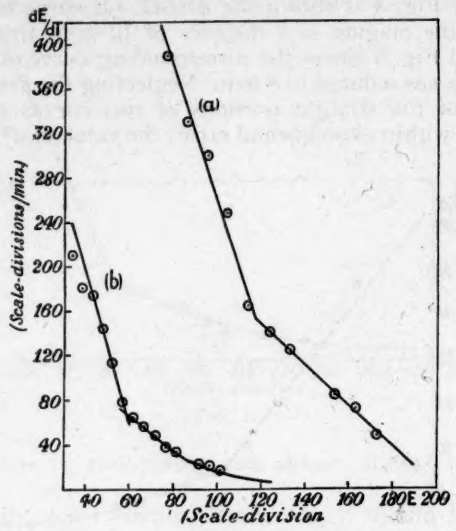

FIG. 6.

Poole also found that the extension corresponding to the point of inflection of the dE/dT—E curve was equal to the greatest reversible extension for the load in question, and was directly proportional to that load. The rate of return of the particle in the vitreous, after switching off the magnet, is so slow that the determination of its final equilibrium position is rather uncertain without careful control of temperature, etc. In the two cases, illustrated in Figs. 4 and 5, the reversible components of the displacements appeared to be 38·2 and 100·8 scale divisions respectively, while the extensions corresponding to the points of inflection of the dE/dT—E curves are considerably smaller, *viz.*, 24·5 and 88·8 scale divisions.

Acidification of the vitreous produces a considerable change in the shape of the T—E curve. Fig. 2*c* shows a curve obtained with ordinary ox vitreous, while in Fig. 2*d* is shown the curve

obtained after addition of a drop of very dilute hydrochloric acid, the other conditions remaining the same. It will be seen that the instantaneous displacement is much increased, while the "creep" is greatly diminished, so that the gel behaves more like an ordinary elastic solid. The reason for this effect is doubtless the shrinkage of the gel and withdrawal of water from the fibrillae, although the acidification was not sufficient to modify appreciably the ultra-microscopic appearance of the gel.

In a previous paper (1932) it was shown that dilute plasma clots had an appearance, an ultramicroscopic structure, and physical

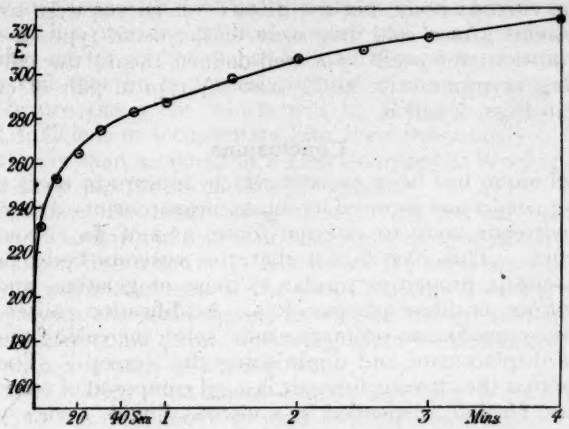

FIG. 7.

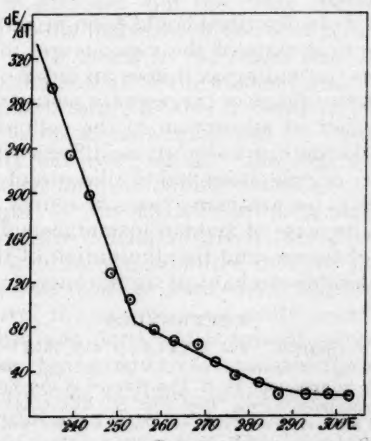

FIG. 8.

properties very similar to those of the vitreous gel. It is interesting that the analogy is further confirmed by its general elastic behaviour. When plasma clots were used, on starting the current in the magnet, the particle suffered an instantaneous displacement, followed by a slow viscous-elastic creep. The instantaneous component of the displacement was, however, a much greater fraction of the whole than in the case of the vitreous body, and the rate of creep diminished much more rapidly. This considerably increased the difficulty of observing the initial phases of the displacement.

The time-displacement curves were similar to those obtained with the vitreous body, but the dE/dT—E curves were somewhat inconsistent. As a rule they were of the usual type—a straight initial portion, followed by a well-defined break, the curve then becoming asymptotic to the E axis. A typical pair of curves is shown in Figs. 7 and 8.

Conclusions

A technique has been evolved which appears to meet the very exacting conditions required to obtain measurements of the response of the vitreous body to external forces and of its viscous-elastic properties. This has shown that the vitreous body possesses viscous-elastic properties similar to those of gelatine, and of the same nature as dilute plasma clots. Acidification causes the gel to behave more like an ordinary elastic solid, increasing the instantaneous displacement and diminishing the "creep." The results indicate that the vitreous humour is a gel composed of a mesh-work of elastic fibrillae suspended in a viscous liquid, a view which is borne out by ultramicroscopic examination, and has previously been fully elaborated.

The technique here described could form a method for the exact study of the physical state of the vitreous gel in different pathological conditions, providing as it does an index of the consistency of the gel and its shrinkage or turgescence owing to the withdrawal or addition of water of adsorption to the colloid micellae. It is interesting that the state of a slightly acidified vitreous corresponds to that of an early degeneration and breakdown of the gel structure. Such a condition is seen in many cases of retinal detachment; and in this state the increase of sudden instantaneous displacement on the application of forces, and the diminution of the slow "creep" may be of considerable mechanical significance.

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A CASE OF GAS-POISONING WITH UNUSUAL OPHTHALMOLOGICAL COMPLICATIONS

BY

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LONDON

THE case which is here reported is very unusual and therefore seems worth recording. It concerns a man, E.H., aged 32 years. He was married, with two healthy children; so far as could be ascertained his previous medical history had been good; his wife stated that so far as she knew he had always been strong and healthy, but that he had been slightly affected by gas about a month before the event which will be related. This gassing was not sufficient to incapacitate him even temporarily.

He is sewer man attached to a Gas Company's Works; he had held the same job for seven or eight years.

On February 15, 1932, being then in his normal health, he went to work and in the course of his employment at about 10 a.m. he went down into a sewer 14 feet below the surface; this sewer, which was within the area of the Gas Company's works, though connected with the main sewer, conducted the effluent from the sulphate of ammonia plant, and was, when he descended, being flushed with a stream of boiling water.

Soon after he had gone down—exactly how long is not known—he called to the men above ground to send down a rope. They shouted down to him but had no answer; how long they waited I was not able to find out, but the delay could not have been long, before one of his mates went down after him.

There was so much steam in the sewer that he could not see him; he came to the surface for a moment and then tried again, but again was unsuccessful; by this time the foreman had arrived and, wearing a gas mask, he went down. He found E. H. unconscious; apparently half-lying against the wall of the sewer; his right arm had fallen into the boiling water.

He was brought to the surface; artificial respiration was at once tried and oxygen inhalation given; an ambulance was sent for and by 11.15 a.m. he was admitted into St. James's Hospital. On admission he was in deep coma; he could not be roused; he had no control over the excreta, and made no effort to swallow. A lumbar puncture was done which proved negative. He had a severe scald of the right arm to a level above the elbow.

He remained in a state of coma for about four days. This was followed by a condition of cerebral irritation. He could be roused during this period by a loud voice, but he did not seem to be

conscious of anything that was going on. He frequently shouted but his remarks were imprecatory without any corresponding cause. I saw him first on February 20; he seemed quite blind, paying no attention to any bright light flashed suddenly on the eyes, but the pupils reacted well to light and the fundi were normal. At first he made no movement of swallowing, but about the end of February a note was made that he swallowed well when food was placed in his mouth, but he made no effort to feed himself. It was stated also in a note made on February 24 that his sense of taste and smell seemed normal, but his mentality was so poor at this time, and for long after, that I should not like to place much dependence on this opinion. Improvement was very slow in all respects; in the early stages the bodily reflexes were absent or could not be elicited with the exception of the abdominal which were generally found, though on one occasion only the left upper reflex was present.

The pupil reflexes to light were always present.

The cerebral irritation was marked up to the end of March; in the beginning of April he began to regain power over the excreta, and by the middle of that month he recognized by their voice, his wife and parents.

During this month slight wasting of the left arm was noted and wasting of the small muscles of the hand.

By June the burns of the right arm had healed, but with much contraction and deformity. His mentality was at this time that of a child about 4 years of age. His vision had improved to perception of light over a considerable field; owing to his mental state and the very poor vision, the field could not be taken accurately, but I thought it was normal to light or nearly so. He left the hospital at the request of his wife at the end of June. He was seen again in July and it was noted "V. p.l. Has perception of colours. Walks well; has some recollections of incidents before accident; still cannot feed or dress himself without help."

My last note was in November, when I noted that his colour perception seemed relatively better than his light perception. The fundi remained normal and the discs of good colour.

Such is the history of this case; what is the explanation? The Gas Company stated that it was not possible for carbon monoxide to be present in the sewer, but I think there can be little doubt that the primary coma was due to this gas; it will be remembered that he had been gassed before, according to his wife's statement, and there is no reason to doubt this. Does carbon monoxide poisoning account for all the sequelae?

Poisoning by illuminating gas is a comparatively common event, but it is very rare to have any serious visual defect afterwards.

After a considerable search in the literature I have been able

to find only a very few cases which are at all comparable to the present.

One case was recorded by Manzutto in *La Clinica Oculistica*, Vol. XI; M. A., aged 70 years, was brought to him on April 7, 1911, with the following history. On the night of November 15-16, 1910, she and her husband were overcome by an escape of gas, and were found unconscious at 11 a.m. on 16th. She did not recover consciousness for three days. On becoming conscious she at once found that she had lost all perception of light. Between that date and the time of Manzutto's examination she had regained a little sight, but only perception of hand movements close to the eyes. Pupil reaction was normal and the visual field seemed normal in extent though it could not be measured at all accurately as the vision was so imperfect. The fundi were normal. At the time of the examination, it is said that there was no disturbance of consciousness or intellect; all movements and speech were normal. Nothing is said about colour vision. It will be seen that though the visual symptoms were equally remarkable as those of E. H., the mental effects were much less.

Fejer, in the *Amer. Jl. of Ophthal.* for July, 1924, reported the case of a stoker, aged 52 years, who entered a tank containing coal gas, which he had thought to be empty. He was unconscious for a few minutes before being brought out. A few days after, his sight failed rapidly to hand movements; but there was gradual and complete recovery. The pupils were normal throughout.

Lindemann, in *Zeitschr. f. Augenheilk.*, Vol. LXI, 1927, reported a case of serious visual defect after a dynamite explosion. In this case there was severe papilloedema, so there is only slight resemblance to the case of E. H.

In 1933 Wechsler reported in the *Arch. of Ophthal.* the case of a boy, H. B., aged 13 years, who was overcome by smoke from a fire which broke out in his home; some of the family died. He had been up to the time of the fire (August, 1929) rather mentally advanced for his age. He was unconscious for two hours; when revived he was blind and could neither hear nor speak. The pupils were equal and active and there were noted to be retinal haemorrhages. In March, 1930, he began to see a little; he could recognize large objects, and could tell colours accurately and at once. His sense of smell was normal. Mentally he had failed and his mental age was estimated to be 7 years and 8 months.

It is at least very rare for gas poisoning to be followed by so many serious symptoms, though illuminating gas is one of the commoner lethal poisons. Death occurs through the action of the carbon monoxide, and it is generally assumed that this gas is the cause also of the destruction of nerve cells which has been shown to follow gas poisoning in severe cases. But I think we are

not entitled to assume this. Illuminating gas and other gases which give rise to carbon monoxide coma are not pure carbon monoxide, but contain many other carbon compounds, and there is some evidence that these are more toxic to nerve tissue than carbon monoxide.

In 1922 H. W. Haggard in the *Amer. Jl. of Physiol.*, Vol. LX, published the account of a very interesting series of experiments bearing on this point.

He had shown that it was possible to take the neuroblasts from an early chick embryo and to grow them in suitable media, in hanging drop culture. He found that grown over air, 86 per cent. of the cultures lived; he then replaced the air by a mixture of gases in which carbon monoxide took the place of the atmospheric nitrogen. In this case 90 per cent. of the cultures developed, showing that carbon monoxide was not unfavourable to the developing neuroblasts.

When he admitted a very small amount of illuminating gas to the chamber (one part in a thousand) all the cultures died at once, showing that there was some very active poison in the new mixture; in so far as I am aware, there has been no further attempt to discover which of the various elements of illuminating gas are specially poisonous to nerve cells, but these experiments are sufficient to make it improbable that all the toxic effects are due to carbon monoxide.

I am indebted to Dr. David Kerr of St. James's Hospital for the notes of the medical condition of E. H. throughout his stay in the hospital.

A CLASSIFICATION OF CASES OF CONCOMITANT STRABISMUS BASED ON THE AETIOLOGICAL FACTOR

BY

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IN the evolution of the treatment of squinting there have arisen from time to time, various theories as to its cause. Each new theory claimed to replace ideas previously held.

Thus, in 1827, Anthony White suggested that as a squint could be cured by a myotomy the original defect was entirely muscular in origin. In 1864 Donders pointed out the connection between hypermetropia and convergent squint, and between myopia and

divergent squint, asserting that the deviation was due to a defect in the accommodation-convergence link. Javal in 1864 and Worth later in 1903, pointed out that some hypermetropes develop a divergent squint and some myopes a convergent squint and that a certain proportion of squinters are emmetropic. They held, therefore, that the accommodation-convergence link was not the primary factor, but that a defect of the fusion faculty was the only feature common to all squints. Still later in 1928 Inman suggested that psychological instability or psychological trauma was one of the essential causes.

It would seem that each theory is tenable provided that it is advanced for a particular group of squinters. The problem for the ophthalmologist is to make a more exact classification of cases of squint.

Worth's book on squint, 1902, laid the foundation for the present-day orthoptic training. He pointed out that by developing the fusion faculty in squinting eyes full binocular vision may be established, and that by using this binocular function the eyes may be trained to a straightness which is maintained under all conditions.

When cases of strabismus are examined for binocular vision for the first time different results are obtained. A case which has had a squint since birth will have very little binocular vision. A case in which the onset of the squint occurred at 5 years of age or later will often have a good fusion sense and even some stereoscopic vision at the angle of squint although the deviation may have been constant for five or more years. One girl, aged 18 years, had had a 20° alternating squint since early childhood. She was operated upon without any previous training and the day the bandages were removed she was found to have good stereoscopic vision. Her eyes may have been occasionally straight when she was a child and so she may have developed stereoscopic vision but she gave no history of such relapses to straightness, even on direct questioning. We may find any grade of binocular vision in cases of squint of many years' duration. This suggests that in some cases the defect in fusion may be the result of the deviation and not always the cause of the squint. Generally cases of late onset have the more fully developed binocular vision.

There are exceptions to the theory that a refractive error is the primary factor, and there are exceptions to Worth's theory that a defect of fusion is the fundamental error; although these theories afford a satisfactory explanation of the origin of many squints.

There remains a group which may be emmetropic and possess Grade III binocular vision and yet a squint develops.

We find that the cases under training fall into four groups.

The first group includes the patients with a definite refractive error who are much improved with their glasses and are unstable

without. They may have very poor or fairly good binocular vision but the main factor appears to be the ametropia.

The second group includes the cases of early onset in which the fusion faculty is very defective. These cases may have refractive errors, but they give the impression of having no idea of using both eyes together and their glasses do not make such a marked difference as in Group I cases.

The third group includes cases which may have a refractive error or may be emmetropic; they may have poor binocular vision or good stereoscopic vision, but they will give a history of having maintained straight eyes until some psychological disturbance gave rise to nervous instability which manifested itself as a squint.

The fourth group where some physical defect is present does not present difficulties in diagnosis, but sometimes insuperable difficulties in training.

An analysis of 500 cases gave the following results:—

		Per cent.
1.	Refraction error squints	62
2.	Fusion defect squints	15
3.	Psychological squints	21
4.	Physical defect squints	2

Refractive Error Squints

These are the squints which fit in with Donders' theory. The hypermetropes converge and the myopes diverge.

The squint may be either unilateral or alternating. In treating a unilateral squint, the vision in either eye must be equalized by occlusion and the squint is often converted into the alternating type in young patients.

The difference stressed by some observers between true and acquired alternation does not seem to be marked in the reaction to training. A true alternating squint alternates spontaneously and it is often found that each eye is used to fix a particular portion of the field of vision so that as the gaze is directed from side to side first one eye and then the other takes up fixation, a quick alternation being produced. On the other hand an alternating squint developed in a previously unilateral squint as a result of occlusion uses the fixing eye over the whole field of vision for an appreciable period of time before taking up fixation with the other eye at will. Nevertheless, true alternating squints can develop firm fusion and stereoscopic vision. If a patient with a true alternating squint of a high degree is taught to fuse at the angle of deviation before operative measures put the eyes straight, the ultimate result tends to be much better than in an untrained case. The images are fused and the depth value of the objects around is appreciated. The

eyes in this case will probably remain straight and controlled during all movements. Where no training has been undertaken before the operation the patient may, in fortunate cases, learn to fuse by his own efforts, but more often the images confuse him and he inclines to recover some degree of deviation of his visual axes in order to alternate again.

Although much can be done by training towards re-establishing a normal convergence-accommodation link the question of the spectacles remains an important one. In a convergent hypermetrope the full atropine correction is well tolerated as a rule and gives the most help. If such a case is put straight by operation these lenses may by reducing the accommodative effort, lead to a tendency to divergence. The best correcting lens is that which gives the best vision with fusion at zero in distant vision. Training does much to stabilize the convergence during accommodation, but in "refractive error" squints the correct spectacles are essential.

Fusion Defect Squints

This type corresponds to Worth's group of squints.

A patient with a squint and good vision in either eye should have diplopia, in a divergent squint the images should be crossed. A small percentage of cases have a constant true diplopia. A much larger percentage will give a history of diplopia at the onset of the condition if questioned carefully. Young children of two years of age may complain of seeing two mothers.

Most of the cases in the group do not have diplopia. They avoid this confusing symptom by one of two methods, suppression or false projection. If the suppression is confined to one eye, the eye becomes more or less amblyopic. If either eye is suppressed when the other eye is functioning an alternation of fixation occurs.

The larger proportion of cases develop a false projection—not a false macula, but a false localization of an object seen by either eye.

If a patient with a convergent squint of 20° is placed in front of a Maddox scale and a rod is placed in front of the convergent eye, the patient may say that the line goes through the light or very near it and nothing will persuade him to change that statement.

If such a patient looks into an amblyoscope he will put the bird in the cage at zero or somewhere nearer to zero than his deviation justifies. Pictures may be fused in this false position and in cases of quick alternation some depth value may be obtained. The patient's desire for binocular vision is strong enough to allow him to fuse images even allowing for the deviation of the visual axes. The mechanism by which this result is obtained appears to be mostly cerebral, but there is a specialized hypersensitive zone lying

between the macula and the false projection spot. In an alternating squint the spot on the retina of the diverging eye which corresponds in position to the macula of the fixing eye appears to develop a special localizing power in conjunction with the opposite macula. It has very little more visual acuity than the surrounding retina and very much less than the true macula. There is, nevertheless, a sensitized band from the false projection spot to the macula. If an image is brought in from the periphery to that area of retina no details can be made out until the macula is reached, but if the pictures are moved centrifugally the image remains clear longer than in a normal eye.

Thus we have three states, diplopia, suppression, and false projection. Diplopia is favourable and unless the squint is a large one the patient is easily trained to fuse the images on the orthoptic instruments and later does the same with surrounding objects, thereby straightening his eyes. If an operation is now performed no difficulty arises, the patient will fuse his images with very little training and will readily correct any residual deviation. The cases of suppression are more difficult, but if treated by occlusion before the eye is irrevocably amblyopic the patients usually can be trained to accept the diplopia and can be treated from that point as above. False projection gives rise to difficulties in straightening squinting eyes by any method. A patient with 20° of false projection who has his eyes put straight by surgical measures will complain of diplopia as soon as the bandages are removed. This is usually a "false diplopia" as his images are falling on each macula simultaneously, but he projects them 20° away from each other. This is a very stubborn condition and does not seem to correct itself easily with training. The patient tries to fuse the images and to do so turns the eye back towards the original position of squint and many of the disappointing results of operation are due to this state of the binocular vision.

Where there is a fixed false projection the best procedure is to try to develop true projection and fusion by training and then to operate. Training in an alternating case with a fixed false projection is very tedious unless the treatment is aided by surgical interference.

In this group the accommodation-convergence link is of very secondary value and spectacles cannot be adjusted to be of use in lessening the deviation as in the "refractive error" squints.

Psychological Squints

This group fulfils Inman's expectation of a patient with squint. The patients are often emmetropic but not invariably so. The age of onset may be early or late in life and the onset of a squint

after eight years of age, unless there is a definite physical cause, suggests the probability of a psychological basis. The diagnosis and identification of such a condition falls into the province of psychology and it is inevitable that ophthalmologists will identify them with variable accuracy and frequency. Inman finds a history of a psychological cause in the majority of cases, but in my estimate the proportion is nearer 20 per cent. (103 cases out of 500). An analysis of these 103 cases gave the following results:—

Imitative squints, 7 per cent.—These patients gave a history of imitating a beloved parent or friend, or an envied person. In one pair of brothers both squinted, the elder one had a large refractive error, and the young one was emmetropic. The young one squinted a week after the elder one. Squinting competitions are not uncommon at school.

Jealousy squint, 10 per cent.—A frequent cause is the advent of a new baby. The elder child will mope and be unhappy and will suddenly squint. The squint may be constant or only occasional as in the child who squinted when he looked at the baby. The wish seems to be to bring the focus of attention back to the patient.

Fear or shock squints, 26 per cent.—The squint in this group often develops as a direct result of trauma. A child who was frightened at night by a drunken father woke up the following morning with a marked and constant squint.

Difficult children, 28 per cent.—Ten of these were left-handed while the others were of that self-willed type that the psychologist associates with left-handedness. Four of the cases also stammered.

Psychoneurotic parents, 29 per cent.—In these cases the home conditions allowed no peace or liberty for the child to develop a balanced psychological background. One child squinted whenever the father corrected her—the father being an irritable person with very evident psychoneurotic symptoms.

Physical Defect Squints

Into this group fall those cases in which the squinting eye is irrevocably amblyopic, either congenitally or as the result of injury or disease. The group must include the rare cases of acquired amblyopia which do not react or respond to occlusion or have developed a false macula. It includes also vertical deviations accompanied by torticollis in which there appears to be a defect in the muscles.

It is difficult to assess the relative significance of the factors concerned in the aetiology of squint as there is so much overlapping and two factors may have an equal value. Nevertheless, grouping based on the classification above has been found useful and of practical value especially in prognosis.

"WHITE RINGS" IN THE CORNEA

BY

H. B. STALLARD

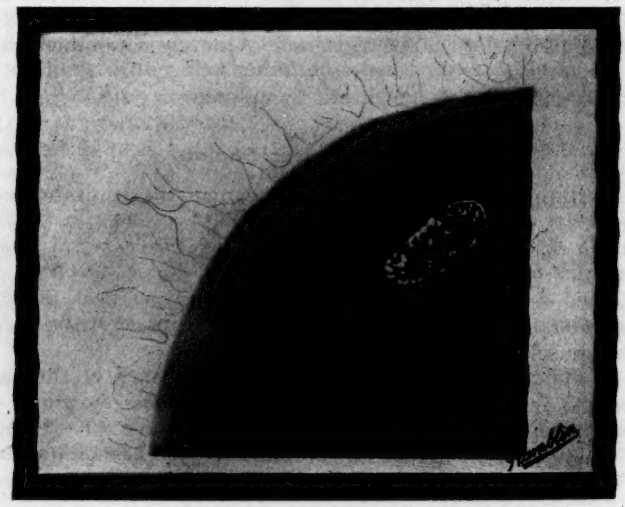
LONDON

GEORGE COATS was the first in this country to describe two cases "showing a small superficial opaque white ring in the cornea." Later he wrote about a third case which presented two rings and a group of white spots in the right cornea and four rings and an incomplete one in the left.

In the *Brit. Jl. of Ophthal.*, Vol. XVII, 1933, Ballantyne has given an account of six cases of this condition under his care and Mayou has written about one case. The comparative rarity of white rings in the cornea is my excuse for placing on record the notes of a patient whom I examined recently.

S. R., a schoolboy, aged 17 years, presented himself for ophthalmic examination on account of left frontal headaches. There was no history of injury, inflammation and corneal ulceration; lotion or drops containing the salts of lead had never been applied to his eyes. The patient's relatives and friends had not noticed any ocular abnormality.

The eyes were in every way quite normal except for a minute broken oval ring of white dots approximately 2 mm. by 0·15 mm. situated in the upper temporal quadrant of the right cornea about



2 mm. inside the limbus. The disposition of these dots is well shown in the illustration. The ring is formed by a row of white dots some of which coalesce and appear to form a continuous line with small constrictions and irregularities in its contour, whilst at other sites there are gaps or breaks of various distances. The outline of the ring is better defined above and at the edge nearest the centre of the cornea. At the outer and lower part of the ring the dots are irregularly disposed and do not form a well-defined line. In the oval centre there are some white spots of irregular sizes and shapes some of which are aggregated at the upper and lower poles whilst others show an attempt to form an oblique line across it. They resemble spots of white-lead paint and are superficial to Bowman's membrane. The overlying corneal epithelium is smooth. There is no evidence of any pathological disturbance in the surrounding cornea.

Coats, by excluding such aetiological factors as injury, inflammation and degeneration, believed that these white rings in the cornea were congenital. Mayou is inclined to agree with this view while Ballantyne regards their aetiology as obscure and criticizes the conception of their congenital cause because it is arrived at only by the process of elimination of other factors. There is to date no record of either a histological or a biochemical examination of this interesting condition.

In the cases reported by Coats, Ballantyne and Mayou the rings were round, oval and pear-shaped; the majority were situated in the periphery of the cornea, but a few were present near its centre.

In two of Coats' cases, five of Ballantyne's and Mayou's case one eye was affected and one white ring present. Two rings were present in one eye of one of Ballantyne's cases, and in Coats' third case both eyes were affected with multiple white rings.

Details of these cases are well described in Ballantyne's article in the *Brit. Jl. of Ophthal.*, Vol. XVII., pp. 336, 1933, and in Mayou's paper that follows this in the same volume. The literature is reviewed in Ballantyne's paper and a list of 16 references is given at the end of it.

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A CASE OF ANGIOMATOSIS RETINAE

BY

W. NICCOL

GLOUCESTER

and

R. FOSTER MOORE

LONDON

THE following case seems to be sufficiently rare to be recorded. The patient was a man, aged 32 years.

He first consulted Mr. Niccol on May 12, 1933, and was referred to Mr. Foster Moore on June 8.

He was a perfectly healthy individual and, until a few months previously, was acting as an air pilot. He passed the R.A.F. test as pilot in 1931 so that, apart from his own statement, it may safely be concluded that his sight was perfect at that time.

Fourteen days before being seen by Mr. Niccol during an attack of "flu.," he noticed a black spot before the right eye, and for the last five days had been troubled by metamorphopsia.

On examination the left eye was perfect in every way. The condition of the right eye was as follows:—

R. V.=6/36. Visual field showed enlargement of the blind spot (Fig. 1) towards the fixation point, but the peripheral field was complete.

Ophthalmoscopic appearances.—(Fig. 2) Immediately adjoining, and partly overlying, the temporal edge of the papilla was a swelling of a peculiar irregular formation, seeming to be composed of a collection of small spherules clustered together, giving somewhat the appearance of a raspberry.

Its general colour was slate-grey; some of the spherules had a reddish or purplish colour, and evidently contained blood.

There were some haemorrhages on the surface, and a few extended along the upper temporal vessels. Rucking of the retina was present, close to the growth and extending towards the macula, and this no doubt accounted for the metamorphopsia. Mr. Niccol estimated that the summit of the growth showed 3 D. of swelling.

June 12. "The accompanying sketch (see Fig. 2) attempts to show the appearance of the growth on this date. It may enable a conception to be formed of the rather raspberry-like appearance of the swelling, its slaty colour, and the purple colour of some of the superficial prominences. The arterial twig passing over the growth appeared to be partly depleted of blood and formed a light line over the surface of the growth, but did not appear to be definitely implicated in the latter.

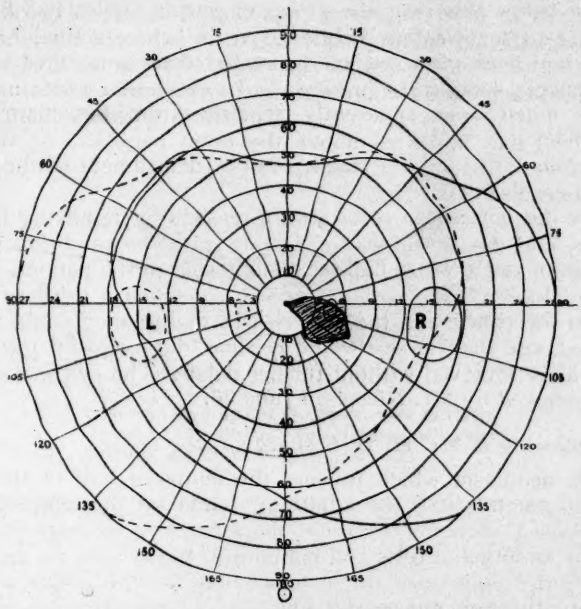

FIG. 1.

FIG. 2.

E. R., male, aged 32 years.
Right eye enucleated June 26, 1933.
Pathological diagnosis: Angiomatosis retinae.

"Just below this twig the group of purple bodies had become confluent to some extent, while above it (where retinal haemorrhages had been observed on the earlier date) a number of very small purple spots were present, and two similar spots not previously noted (one apparently separate from the main mass altogether) had appeared above the optic papilla. At the site of previous "rucking" a small, shallow detachment of the retina was noticeable." (W. N.)

There did not appear to be strong reasons for removing the eye at once, and the possibility of dealing with the condition by the insertion of radon seeds had been suggested to the patient. However, on June 17, the patient, having consulted a third surgeon, came to the conclusion that the risk of malignancy could not be excluded, and that the eye would become blind, and he urged that it should be removed without further delay. The eye was accordingly removed by Mr. Niccol on June 26.

The following is Mr. H. B. Stallard's report:—

"The neoplasm which invades the temporal half of the optic disc and extends into the adjoining retina on the temporal side is composed of many irregular-shaped spaces of various sizes, lined by endothelial cells and containing blood. At the temporal edge of the optic disc the neoplasm at several points projects forwards through the nerve fibre layer and into the vitreous chamber. The outer nuclear layer of the retina is considerably disorganized by the neoplasm which has compressed and destroyed the rods and cones for about 1 mm. adjacent to the optic disc, and the overlying choroid at this site is flattened. Neuroglial tissue is present between the cavernous spaces, which communicate with branches of the central retinal vessels. At one site there is an area of hyaline degeneration. Some oedema is present in the retinal part of the neoplasm and a thin sheet of blood extends outwards towards the macula between the retinal pigment epithelium and the rods and cones. A few small haemorrhages are present on the summit of the neoplasm over the optic disc."

"The photo-micrographs of transverse sections through the neoplasm and the optic disc illustrate some of its more important histological features. There is no evidence of malignancy or extra-ocular extension. Pathological diagnosis. Angiomatosis retinae."

The condition is a very rare one and we imagine had been present since birth, but had recently increased in size and involved the macula, and so had given rise to symptoms which led to its discovery.

Without in any way criticising the decision to remove the eye, it is a case which we believe could have been successfully treated by means of radon.

In order to obtain satisfactory access, division of the external rectus would have been necessary and, from this, disturbance of muscle balance might have ensued; further, it would not be possible to guarantee immunity from damage by the emanations to the optic nerve and adjoining retina.

FIG. 3.

Photomicrograph of low power view of transverse section through the globe showing the disposition of the neoplasm (a).

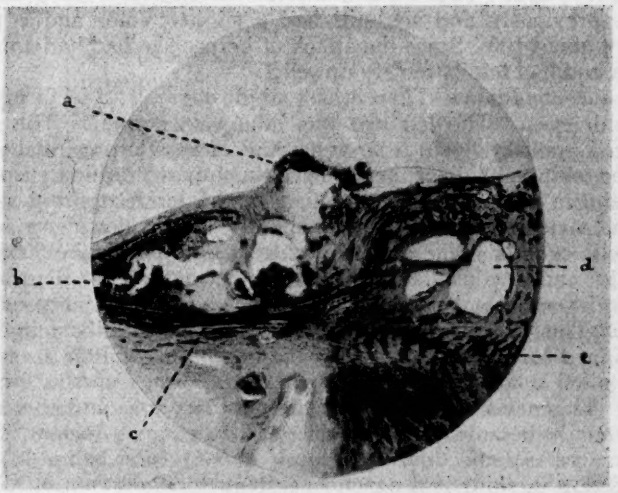

FIG. 4.

Photomicrograph of a transverse section through the temporal half of the optic disc and the adjoining retina and choroid.

a. Part of the neoplasm projecting forwards into the vitreous.
b. The neoplasm invading the outer nuclear layer.
c. Destruction of the rods and cones and the outer nuclear layer at this site.
d. Cavernous spaces in the temporal half of the papilla.
e. Lamina cribrosa.

CASE REPORT—AGRANULOCYTIC ANAEMIA FOLLOWING HERPES OPHTHALMICUS

BY

IDA MANN *and* DORIS BAKER

LONDON

IN view of the variety of conditions with which agranulocytosis has been found associated and of its relative rarity the following case is reported, although it is fully realized that its ophthalmological interest is small and that probably very little connection exists between the antecedent ocular condition and the subsequent history.

The patient, M. N., first consulted one of us (I. M.) in August, 1931. She had had in June, 1931, an extremely severe attack of right sided ophthalmic herpes of which the ocular complications had not cleared up.

General condition.—The patient was a rather nervous woman, aged 38 years. There was a history of exophthalmic goitre 10 years previously and she still had a slight tremor and a pulse rate of about 100. Since the attack of herpes she had had amenorrhoea and had felt extremely unwell.

Ocular condition.—There was a slight degree (−1·5) of myopia in both eyes. The left eye was otherwise normal. The right showed a ciliary flush, a large amount of keratic precipitates and on the temporal side of the sclera a bluish patch, at first suspected of being a commencing staphyloma and later recognized as one of the slate-coloured scars occasionally seen following a severe herpetic cyclitis. The patient was treated with atropine and heat locally, and in consultation with the other author (D. B.) was put on to bromide and other sedatives for the general nervous condition. The cyclitis proved most intractable and the ciliary injection continued for seven months. At the beginning of 1932 a vascular interstitial opacity developed in the right cornea on the temporal side. This never encroached on the pupillary area and after about five months became quiescent, the opacity being permanent. There was never any affection of the optic nerve, vision being 6/5 with correction in spite of the fact that the precipitates continued until the time of the patient's death three years after the original attack. During 1932 the patient had various septic affections. In February she developed an axillary abscess, and in August had an acute attack of tonsillitis. She had severe pyorrhoea and had some teeth extracted. She had some gold bridge work which was not removed. In March, 1934, she began to complain of pain in her left cheek and frontal headache. The pain was most severe over the left upper wisdom tooth. About 10 days later she developed a sore

throat with enlarged submaxillary glands and a temperature of 101°F. Seen in consultation by D. B. she was admitted to the South London Hospital for Women. On admittance temperature was 101·5°F., pulse 88, respiration 20. The patient was drowsy and felt ill. There were no physical signs other than a red injected throat and a moderate general swelling of the cervical and submaxillary glands. The sinuses were clear. A Widal test (completely negative) and a blood count were done, the result of the latter being:—

	per c. mm.
Red cells	4,000,000
White cells	500
Haemoglobin	90 per cent.
Colour index	1.1

Differential white count.	per cent.
Polymorphonuclear cells	1
Lymphocytes small / large	96
Large mononuclear	3
Eosinophils	0
Basophils	0

A swab from the throat showed no pus, with a few cocci only. A small growth of non-haemolytic streptococci, staphylococci and a saprophytic bacillus was obtained. The organism of Vincent's angina was not present; a catheter specimen examined was sterile.

A diagnosis of agranulocytic angina was made and the patient was immediately put on daily doses of 40 c.c. of pentose nucleotide and was given a blood transfusion. The following day a further blood count was done and no polymorphonuclear cells could be seen at all, nor did any reappear in the blood before death. Treatment with pentose nucleotide 40 c.c. daily, hepastab and coramine, was continued; the blood transfusions after the second were abandoned as they greatly distressed the patient and were of doubtful value. In spite of this the patient developed physical signs of pneumonia six days later. The temperature rose to 106°F., respirations to 56, and she died on March 29, eight days after the diagnosis had been made.

This case recalls that which Sir Arnold Lawson reported to the Ophthalmological Society of the United Kingdom in April this year in that a slow chronic ocular inflammation (in his case choroiditis, in this cyclitis) was associated with recurrent attacks of septic infection ending in death from agranulocytosis. In Sir Arnold's case the patient was much older and the history of nasal

sinusitis almost life-long. In the present case severe pyorrhoea, tonsillitis and an axillary abscess occurred during the three years preceding the patient's death, nothing being known of her previous history.

There seems a possibility that chronic ocular conditions which fail to react to treatment may in some cases be associated with an altered blood picture a study of which may materially modify the line of treatment and also the prognosis.

In view of the recent suggestions that the barbiturate group of drugs given alone or in combination with amydopyrin may exert a selective toxic influence upon the marrow elements, more particularly the granulocytes with the production of a primary agranulocytosis, it should be recorded that this patient had from time to time taken veramon (amydopyrin methylbarbiturate) for headache and at the onset of her illness was given this drug once or twice a day for the pain. She had, however, taken a course of theominal (luminal and theobromine) for a period during the previous year without any ill effects.

SPANISH-ARABIC OPHTHALMOLOGY

BY

A. F. MACCALLAN, C.B.E.

LONDON

To celebrate the International Congress of Ophthalmology held at Madrid last year the well-known firm of Cusi (The Laboratories of the North of Spain), decided to publish a translation of the works of a twelfth-century Spanish-Arabic author. This author is named Mohammad ibn Qassoum ibn Aslam al-Ghafiqi, whose manuscript is treasured in the library of the Escurial, bearing the title "Al-Morchid fi' l-Kohhl." Very little is known about the author except that he lived at Cordova and practised as an oculist.

The translation of the Arabic original into French was confided to Dr. Max Meyerhof of Cairo, the distinguished medical-orientalist, to whose erudition reference has repeatedly been made in the *Brit. Jl. of Ophthal.*

A large part of the manuscript is concerned with general medicine and natural philosophy, and it is only the sixth book or chapter which is specially devoted to ophthalmology. Of this the fifth section constitutes the main part of the translation, and for its matter the published work of a celebrated oculist, Ali ibn 'Isa, who practised at Baghdad about A.D. 1000, has been drawn upon largely by Al-Ghafiqi.

Dr. Meyerhof's remarks on the collyria in use in the East in ancient times are of great interest. Liquid collyria are only a comparatively recent invention and were quite unknown to the ancients. Also the lack of a stable fatty base prevented the preparation of really good ocular ointments. The old ointments were made up with honey or wax, and sold either in pots or made up into sticks. Descriptions of these are found in the Ebers papyrus, which was copied about B.C. 1650. Ocular cosmetics were known in the Nile valley more than a thousand years before this; they were made of powdered malachite or sulphide of antimony.

The Greeks enriched their ocular therapeutics from the experience of the Egyptians and Babylonians, and, in their turn, transmitted their knowledge to the Romans and Arabs.

Throughout the middle ages the physicians of Europe did not create a single treatise on ophthalmology comparable to those of the Arabic oculists. It was necessary to wait until the beginning of the eighteenth century to find in the works of Saint-Yves, Maitre-Jan and Brisseau any notable progress since the time of the great Arabs.

Some of the Moslem physicians of Spain left records of visits to Baghdad to gain professional knowledge and it may be that our author, Al-Ghafiqi, made this journey.

His observations on cataract, preliminary to operation, are sound, the patient must have good perception of light, the pupil must be active and the general health good.

The patient must have no cough, his bowels should be evacuated and he should gargle for several days before the operation. A venesection may be indicated and his diet carefully ordered.

On the day of operation the wind should be from the north, to avoid the heat and dust storms which are prevalent with a wind from the south, and the day should be sunny since in the Orient cloudy or wet weather makes everybody feel miserable. These tips Al-Ghafiqi must have learnt in Baghdad.

The description of the operation is as follows:—The patient sits on a cushion with his knees drawn up against his chest, and his hands clasped round his legs. The operator sits on a low chair in front of the patient. The eye which is not to be operated on is to be lightly bandaged. An assistant stands behind the patient and steadies his head. The right eye is operated on with the left hand and the left eye with the right hand. Pressure is made with the handle of the needle on the sclerotic at the point where it is proposed to insert the instrument; this is done for two reasons, first to accustom the patient to maintain the eye stationary, and second to make a little depression on the sclerotic, so that the needle when entering shall not slip. It must be remem-

bered that the needle was not very sharp, being made of gilded copper. The needle is then entered at the level of the pupil, or a little higher, at a distance from the corneal margin equal to the length of the spear-headed point of the needle, four or perhaps five millimetres. The needle enters the posterior chamber. At the same time the globe is steadied with the finger and thumb of the free hand.

The needle is entered as far as the pupil or a little farther. Then the patient should be gently encouraged to remain perfectly quiet, while the needle is inclined until it is seen just above the cataract. Then the handle of the needle is raised very slowly, pushing the cataract downwards. If the cataract is at once depressed, the needle should not be removed until it is seen that the cataract does not reassume its original position. If it does the manœuvre must be repeated. The needle is then withdrawn, and both eyes are bandaged.

This is an excellent description of the operation of couching a cataract.

I have seen in Egypt many patients for whom this operation had been done by travelling quacks, generally of Moorish origin. The majority of the patients were already blind as the result of the supervention of glaucoma, but occasionally a permanently good result was seen. The striking factor of the operation is the immediate improvement of the visual acuity, which, however, may be lost quickly as the result of inflammation or more usually as the result of glaucoma.

Al-Ghafiqi describes four kinds of trachoma. The first is a redness of the internal aspect of the eyelid, which is covered by tiny little grains (our stage I of trachoma). This often begins as an acute ophthalmia (a fact which was rediscovered by Morax and Lakah in 1902). The second variety presents a greater roughness of the conjunctiva, and is accompanied by pain and heaviness of the lid (our stage II*a*). When the acute ophthalmia has subsided the treatment of the trachoma must be undertaken. In the third variety the roughnesses of the conjunctiva are more pronounced and look like the fissures in an opened fig; here the author intends to describe the marked papillary hypertrophy found in stage II*b*. The fourth variety is more dangerous and more chronic and is associated with trichiasis-entropion (our stage III).

As regards treatment the author prescribes in bad cases mechanical treatment (curettage or brossage) with either sugar or an instrument, and the application of corrosive remedies, in fact, exactly the same treatment as is used at the present time in trachomatous countries for the treatment of one of the stages (II*a*) of the disease.

The operative treatment of chalazion by incision and evacuation of the contents with a curette is correctly described.

The treatment of lacrimal abscess by incision, scraping and probing is recommended as preferable to an expectant treatment.

Some of the prescriptions which Al-Ghafiqi gives contain curious ingredients. For loss of pigment of the eyelashes or canities the receipt is as follows:—Burn snail shells and triturate with the fat of wild goat or bear and with the mixture massage the palpebral borders. Many of the other remedies are equally surprising.

Meyerhof's book, which is called "Le Guide d'Oculistique d'Al-Ghafiqi" is tastefully arrayed in vellum with an Arabic inscription. It is beautifully printed at l'Institut graphique Oliva de Vilanova at Barcelona.

FOCAL INFECTION IN DISEASES OF THE EYE*

1.—Report of Certain Laboratory Examinations

BY

CONRAD BERENS, M.D., PAUL T. CONNOLLY, M.D., *and* GEORGE H. CHAPMAN, B.A.Sc.

NEW YORK

Outline

1. Introduction.
2. Serological methods.
   - *a.* Complement fixation.
   - *b.* Agglutination reactions.
   - *c.* Intradermal tests.
3. Bacteriological methods.
   - *a.* Rough and smooth differentiation.
   - *b.* Staphylococci.
   - *c.* Enterococci.
   - *d.* Significance of toxicity and other tests.

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* From the Laboratory of the Lighthouse Eye Clinic of the New York Association for the Blind and the Clinical Research Laboratory, New York. Abstract of paper read by title before the Fourteenth International Congress of Ophthalmology, Madrid, April 16-22, 1933

This study was aided by a grant from the Ophthalmological Foundation, Inc.

4. General considerations of certain foci.
    - *a*. Examination of teeth.
    - *b*. Faeces.
    - *c*. Throat.
    - *d*. Nose.
    - *e*. Prostate.
    - *f*. Distribution of bacteria in various foci.
5. Clinical diagnosis and the results of sero-bacteriological tests.
6. Summary.
7. Conclusions.

Much valuable information has been published concerning the relative importance of focal infections as contributing causes of various diseases of the eye. (See *e.g.*, de Schweinitz[1] and MacNevin and Vaughan[2]) In most of these contributions, the arguments presented and the diagnoses made were based on clinical and allied procedures. For years we have doubted whether, in a given ocular disturbance, a determination of the aetiologic rôle of focal infection could be made by the usual clinical methods, or whether it was "largely a matter of exclusion" as contended by Corley.[3]

It is not our purpose to discuss the nature of the underlying cause of the eye disease, whether it is a true infection, a toxin or an allergic reaction, or to suggest treatment, but rather to report a critical survey of sero-bacteriological studies undertaken in an effort to evaluate such methods for the determination of the aetiology of certain diseases of the eye.*

Complement fixation.—Complement fixation reactions with the patient's own bacteria performed in 5,000 cases, were found to be unsatisfactory because the titer of the antigens could not be accurately determined by the usual methods.

Agglutination reactions.—The agglutination reaction was of considerable assistance in differentiating pathogenic from non-pathogenic bacteria, particularly streptococci, as the former were usually agglutinated to a high titer by the patient's serum. Many of the very toxic strains gave poor agglutination. While toxic

* It is impossible, in the present state of our knowledge, to prove that the bacteria to which the patient gives positive sero-bacteriological reactions are the direct cause of the disease of the eye, but it is also difficult, if not impossible, to demonstrate that a certain inflammatory disease of the eye is due to tuberculosis or syphilis unless the organism can be recovered from the eye lesion. Meller[12] has recovered tubercle bacilli from the intra-ocular tissues in a case of uveitis.

bacteria were often agglutinated in high titers, the relation between agglutinability and toxicity was only a general one.

Intradermal tests.—Although the reactions to intradermal tests are frequently used for the selection of organisms in the preparation of vaccines, this method has been shown to be subject to error. It may be positive in the absence of infection. It may be negative in the presence of infection. We have used it as a guide to the determination of the initial dose of vaccines and consider it helpful for this purpose.

Rough and smooth differentiation.—It is well-known among bacteriologists that most bacteria exist in several forms, the best known being the "rough" and "smooth" types. There is ample evidence in the literature that the rough type lacks virulence and is not suitable for the preparation of vaccines. On the other hand, organisms of the smooth type are frequently pathogenic, in which case they are most satisfactory for the preparation of vaccines. Consequently, it is important to study bacteria of the smooth type and we have found that the best method of selecting them is to use Rosenow's brain-heart infusion for primary isolation. Rough strains settle to the bottom of this medium. Transplants from the higher levels yield a large proportion of smooth strains not only of streptococci, but also of M. catarrhalis, staphylococci, and other bacteria.

Significance of toxicity and other tests.—The work so far indicates that organisms causing focal infection can usually be differentiated from the "normal flora" by the fact that they react more strongly to tests for toxicity and agglutinability. While this is usually true, we have observed instances in which organisms considered to be focal invaders have given none of these reactions.

Examination of teeth.—Using *bacteriological caution* teeth are extracted, broken open, and the various sections cultured separately. In this way we are able to avoid extensive contamination which would occur if, as is usually done, the whole tooth is dropped into a liquid medium. With these precautions we have been able to obtain a high proportion of relatively pure cultures of streptococcus viridans. Excluding peri-apical abscesses, the finding of other bacteria suggests contamination.

Faeces.—The most significant finding in our faecal examinations was that the total number of B. coli seemed to bear a direct relationship to streptococcal infection or intoxication. We have observed many cases where the relative absence of B. coli was probably associated with a streptococcal focus.

Distribution of bacteria in different foci.—Streptococci of the viridans type were found more frequently in the throat than in any other focus. They were also fairly common in the faeces, but the faecal strains usually gave poor agglutination. Staphylococci were found as often in the nose as in the throat and only rarely in faeces.

Summary

We have attempted to make a brief survey of the correlative value of some of the reactions available for the study of the bacteriology and immunology of focal infection. It is of paramount importance to appreciate that a given pathogenic micro-organism may not, in every instance, produce pathogenic effects. There are factors other than toxicity and immunity which enter into the host-parasite relationship. Sometimes the mere release of pent up necrotic material will give rise to relief from symptoms. This is the important underlying principle of surgical drainage. It is also the basis for relief of stasis of the colon and, no doubt, explains the beneficial effects of agents which increase peristalsis. Mucous membrane integrity and the length of time the toxin is in contact with the mucous membrane are as important in the production of an infection as is the power of a given micro-organism to produce disease. Therefore, in any given instance it is not alone necessary to demonstrate that certain bacteria are pathogenic; one should also attempt to discover specific antibodies or by other means ascertain that the bacteria or their toxins have penetrated the defensive mechanism.

In our survey of the reactions selected for determining any of the above factors, we have attempted to point out both the limitations and the value of each and have given a critical appraisal of their value for the study of focal infection. By a critical correlation of all these reactions one should be better able to evaluate the rôle played by each organism in the production of the pathological processes affecting the patient. In many instances, evidence may be discovered of foci which were not revealed by the history and the physical examination. Sometimes the patient is not aware of certain symptoms until they have been suggested from the results of these tests.

These studies emphasize the futility of relying on only one test, so far described, as a measure of the importance of any organism either in diagnosis or as a basis for the preparation of vaccines. Tests of toxicity of one organism have not always been found suitable for others. Serological tests may be of great value in the study of certain groups and of limited value in others. Among

the tests which we have found of decided value *when used in conjunction are*:—Agglutination; rough and smooth differentiation; bactericidal tests; electrophoresis; coagulase and haemolysis reactions for staphylococci; animal inoculation—either of the live or killed culture.

One thought which has been constantly in mind is that the inclusion of every available test would increase the cost of each examination to a prohibitive amount. While we feel that the question of cost should be secondary to the value of the work to the patient, we have hesitated to use such reactions as elective localization which would require the use of a considerable number of rabbits to test all the strains isolated from each patient. The method has excellent possibilities and is worthy of further study. Some reactions require standardization before they are available for routine use, and interested ophthalmologists may consider it worth while to include other methods which we have not yet had an opportunity to study.

Conclusions

1. We believe that the presence of a high agglutinin titer to an autogenous strain of streptococci is strong presumptive evidence that the strain is related to a focus of infection, but the converse is not necessarily true as we have observed a number of instances where inagglutinable or weakly agglutinable organisms were undoubtedly of focal origin.

2. Many of these low titer strains give positive toxicity tests.

3. Using the term "pathogenic" in its broader sense, we have not found a bacteriological or serological reaction which is generally applicable to the differentiation of "normal" from pathogenic bacteria of all the species studied.

4. Our results indicate that errors of certain tests can often be detected by the simultaneous use of other tests. For example, many strains of staphylococcus aureus and B. coli gave poor agglutination but strong toxicity tests. Subsequent experience indicated that these strains were probably related to the patient's foci of infection and were, therefore, as important as those which gave strong agglutination.

5. Correlation of a number of different methods should assist in the evaluation of the rôle of any micro-oganism as a focal invader.

6. The simultaneous use of a number of different serobacteriological reactions has given us information as to the identity and probable location of organisms thought to be responsible for certain lesions of the eye, and has often suggested a hitherto unsuspected focus.

7. We believe that these reactions are of decided value to the ophthalmologist in studying diseases of the eye which are possibly due to focal infection. These tests are also of value in determining the progress of treatment.

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ANOPHTHALMOS:

An unpublished Manuscript by James Briggs giving the first account of the familial occurrence of the condition

BY

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IN his *Prodiogorum ac ostentorum chronicon* . . . Anno mundi 3772. Basle [1557] a strange medley of fact and fable, Lycosthenes relates of a child lacking eyes and ears but otherwise well formed. The same curiosity is noted by Schenk *a Grafenberg* in a similar publication (*Monstrorum historia*, Frankfort, 1609). The earliest creditable account of bilateral anophthalmos comes from Thomas Bartholin (*Historiarum anatomicarum rariorum.* Centuria III. Observatio 47. Amsterdam, 1657). Bartholin relates of an anophthalmic child showing, in addition, maldevelopment of the nose and mouth, six fingers on each hand and six toes on the left foot. Subsequent observations abound, but it was only towards the end of the last century that familial cases of the affection were reported. To this statement two exceptions must be made, to both of which Treacher Collins drew attention in his article on Anophthalmos (*Ophthal. Hosp. Repts.*, Vol. XI, p. 429, 1887). One is a short note in the *Lancet*, Vol. II, p. 109, 1831-32, in which John Walker, "one of the Assistant Surgeons of the Manchester Eye Institution, etc.," reports

"two children (sisters), the elder five years of age, the younger four months. It may be mentioned by the way, that the parents have an intermediate child, a boy, happily free from this lamentable defect. Exactly the same appearances are observable in both. Instead of the natural convexity of the eye-lids, supported by the globe, they have the sunken appearance commonly presented where the contents of the orbit have been evacuated or removed. The aperture between them is very small, not exceeding a quarter of an inch in the transverse direction, but they appear to possess the usual muscular movements.

The orbit appears to be occupied merely with the common cellular substance, which affords little resistance when the finger is applied over the lid When the children cry, copious lachrymation takes place, proving the existence of a lachrymal gland, but the tears always roll down the cheeks in consequence of the non-existence of the puncta lachrymalia. So that, in a word, these cases may be described as consisting in a total absence of the globe of the eye from each orbit, attended with a like deficiency of the lachrymal passages."

The other is a footnote in Weller's *Manual of The Diseases of the Human Eye* (Vol. II, p. 207, Glasgow, 1821) by its translator, G. C. Monteath:

"I have twice visited the family of W. L., a respectable grocer in the neighbourhood of this city (Glasgow). The first, second, and fourth of his children (eight in number) were born without any vestige of eye-balls. The two eldest of these

children were otherwise perfectly formed and healthy, but the second died in her sixth year from chincough; the third was born a delicate child, and died when eight months old. Their eye-lids and the lachrymal passages were perfectly natural. These children have been repeatedly attacked with inflammation of the eye-lids and cavity of the orbit. The edges of the tarsi of the eldest, now a boy of fourteen years of age, have, in consequence of these inflammations, adhered to a considerable extent (Anchyloblepharon imperfectum) so that the opening into the sockets is now very small."

Familial anophthalmos is an extremely rare condition. Strange it is that whilst Monteath observed a family in Glasgow in 1821 and Walker another in Manchester in 1832 yet a third family was observed in London in 1813-26. The account of this family is fuller than the reports by Monteath and Walker and is contained together with description of an ovarian dermoid in an unpublished MS. by James Briggs, at the library of the Royal College of Surgeons (275 h 2 17). Both for its fulness and because it must be considered the earliest account of the familial occurrence of anophthalmos Briggs's account deserves publication:

Some Particulars of a family in which four of the children were born with a total deficiency of the eye-ball.

Among the great variety of malconformations of the human body which have been recorded, I have met with no account of a total deficiency of the eye-ball, except in those cases of monstrosity in which the brain itself has been wanting and where the organs which are dependent on it, must of necessity be wholly or in part defective.

An example of this kind however having come within my own observation a few years ago, not in a solitary instance but in several members of the same family, a relation of the principal circumstances of so singular a phenomenon may not in a physiological point of view be wholly without interest..

Clarke and Mary Willding, the parents of the unhappy offspring alluded to, were to all appearance healthy, both of fair complexion and slight form, the size of the eye-ball in each was small, but not in such a degree as to be remarkable, and had not my attention been particularly directed to this point it might have passed without my observation. The age of the father was about 40, the mother 35, they have had seven children, four of these were born without any appearance of eye-ball and are now living (an: 1813). Of the three children born in a natural state one only, the eldest, survives. The following is a list of their respective ages, from which it will appear that this peculiar defect was neither connected with the sex nor the order of the succession of their births.

1.	Charles	Aetat.	20	
2.	John	,,	18	blind, both eye-balls deficient.
3.	Jane	,,	12	blind, both eye-balls deficient.
4.	Mary	,,	5½	dead.
5.	George	,,	1½	dead.
6.	Mary	,,	5	blind, both eye-balls deficient.
7.	George	,,	6*	blind, eye-ball of the right side deficient, eye-ball of the left side malformed.

In all the four instances of malformation with the exception of the last, the appearances connected with this defect were precisely similar so that the description of one of these will serve for the rest.

On each side there was a total deficiency of the eye-ball. The eye-lids which were constantly kept closed were much smaller than natural and beset with strong,

[* Though thus written, apparently means 6 *weeks*, see below.]

dark eye-lashes. The opening between them was only large enough to admit a crow's quill. On examination the tarsal cartilages were distinctly perceptible, and the presence of the lachrymal gland was sufficiently demonstrated by the secretion of tears so that the external apparatus of the organ might be said to be complete. In the place of the eye-ball, there was a small funnel-shaped opening formed by a continuation of the membrane lining the eye-lid, and terminating towards the posterior part of the orbit by a small aperture into which the point of a probe could be readily introduced. On passing a probe into this aperture at the lower part of the orbit in order to determine the extent of it, the irritation which it excited occasioned a copious flow of tears.

In the youngest child (George), 6 weeks old, the eye of the right side was entirely wanting, presenting the peculiar appearances already described in the other children. On the left side the organization of an eye-ball was perceptible, but the part was so diminutive that the cornea represented merely a black speck upon it scarcely exceeding the size of a pin's head. From the exceeding minuteness of the parts, the almost constant closure of the palpabrae, and the perpetual rolling motion of the eye, there could be no reason to conclude that the child had any perception of light, much less power of vision. The mother, however, affirmed that the child manifested some uneasiness whenever the strong light of a candle was brought near to it.

Six or seven months after this memorandum was made John, the eldest of the blind children, died. I was informed by his mother that this took place after a few days' illness without any particular marks of his labouring under a fatal disease except great palpitation of the heart. This circumstance, together with a remarkable blueness of the lips and finger-nails which he had had from birth, leaves little doubt that there existed, at the same time in this instance, that remarkable malformation of the heart in which from a deficiency of the septum the venous and arterial blood became mixed. In the other children no such appearance is observable, and it may therefore be presumed that the defective formation is in them confined to the organ of vision alone.

My observation being directed to the changes which took place in the infant before mentioned, I found at the end of 6 months no perceptible difference in the eye-ball, except that it had increased in growth with the rest of the body. At three years of age the organ was so far developed that its form could be more accurately defined.

The cornea was at this period something less than $\frac{1}{4}$ of an inch in diameter, flattened on its surface, and its texture extremely dense; yet it was evident that he possessed the power of distinguishing light and the involuntary motion of the eye continued unabated.

I had lately an opportunity of seeing this boy, now in his 13th year, and found the parts to have undergone no change except in bulk, and this was chiefly confined to the schlerotic portion of the eye, the cornea remaining nearly in the state already described. He possessed, however, more command over its motions, and had a strong perception of light.

I am disposed to believe that this example of original defective formation of the organ of sight, constitutes a species of congenital blindness not extremely rare, having met with one or more instances of a similar kind in adults in which this wasted appearance of the eye could not be traced as consequent upon any injury or previous disorder.*

The increased powers of certain organs of sense or of the mental faculties depending on them, where there has been a privation of others, has been often remarked, and is strikingly exemplified in the elder sister with regard to the memory of sounds. Having been taught music she is able by three or four repetitions only of the subject, the notes being simply repeated to her, to retain and execute passages even of considerable length.

The mother of the children being dead, the father has married again and has, by his second wife, two children, both healthy and well formed.

J. BRIGGS.

* The general appearance of the eye in these cases resembles very strongly the shrunk-state of this organ, where the humours have been discharged in consequence either of internal suppuration and rupture of the tunics, or of unsuccessful operations performed upon it.

The aetiology of anophthalmos is still a disputed problem. The paper by Briggs is sufficiently detailed to constitute a contribution to the literature on the subject even to-day—well over a century after it was written. It supports those who believe that the explanation must be sought along the lines of recessive hereditary maldevelopments rather than in ante-natal inflammatory processes.

James Briggs is known to ophthalmology as the translator of Scarpa's *Practical observations on the principal diseases of the eye* of which two editions appeared, one in 1806, the other in 1818. He was one of the growing number of general surgeons at the beginning of the last century who were turning to the study of ophthalmology. In the preface to the second edition of his translation he pleads eloquently against the neglect of the speciality by the general surgeons. As surgeon to the Lock Hospital his main interest would appear to have been surgical. In addition to two other translations of publications on general surgery by Scarpa, he himself contributed a short monograph on *Treatment of Strictures of the Urethra by Mechanical Dilatation* (London, 1845). What little is known of his life is contained in a short note in Plarr's *Lives of the Fellows of the Royal College of Surgeons of England*, based on information in the obituary notice in the *Lancet*, Vol. I, p. 406, 1848. His date of birth is not known. He became M.R.C.S. in 1804 and was one of the original 300 fellows of the College (1843), to the Council of which he was co-opted in 1828. He died on March 29, 1848.

I am obliged to Mr. R. R. James for the following additional information: a James Briggs took a three months' course of study at St. George's Hospital under Mr. Home (later Sir Everard Home) on July 7, 1802, and a further three months' course in September of the same year.

I am indebted to Mr. W. R. Le Fanu, Librarian of the Royal College of Surgeons' Library, for permission to publish the Briggs M.S., for the footnote on the age of the seventh child, and for his interest in this paper. To Mr. S. Wood, of the Library staff, I am indebted for his never-failing courtesy and for the careful transcription of the MS.

ANNOTATION

Blindness among Jews in Palestine and its causes

A reprint of a paper by Shimkin, published in the Comptes Rendus du Congrès International de Médecine Tropicale et d'Hygiène at Cairo in 1928 has only recently reached us.

At that date no official census of the blind had ever been taken in Palestine, though statistics of some value in connection with blindness among Moslem Arabs in the country were available. Roughly speaking, there were 75,227 Moslem Arabs. Of those examined at the travelling Ophthalmic Hospital from August, 1919, to June, 1923, new attendances amounted to 14,801, of which those afflicted with trachoma accounted for 64·2 per cent., whilst 12·6 per cent. of the total showed blindness in one eye and 6·1 per cent. blindness in both.

The ratio of the blind among the Moslem population amounted to 120 per 10,000. No actual data were available of the incidence of blindness among Christian Arabs, but as these mainly dwell in towns within reach of medical aid, the author concludes that the percentage of blindness among the Christians is much less than among the Moslems.

Shimkin's figures with regard to blindness among the Jewish population were taken from the 1926 census. The definition of blindness is that propounded by Trousseau, inability to count fingers at a distance of one metre from the eyes. The rate of blindness in Jews in Palestine would appear to be about 15 per 10,000.

The author's conclusions to this valuable report may be summarized as follows:— 1/3rd of the total number of blind Jews came from abroad, 2/3rd became blind in Palestine. The main causes were:—Glaucoma 26·3 per cent., trachoma 25·6 per cent., acute conjunctivitis 23·4 per cent. Adult gonococcal conjunctivitis is relatively uncommon and no case of ophthalmia neonatorum has been "so far" seen in Palestine among the Jews.

The development of acute conjunctivitis depends on the temperature and rain-fall of the locality, irrespective of altitude, latitude or longitude. In any campaign undertaken to combat blindness in Palestine measures must be taken in the first place to deal with trachoma and acute conjunctivitis. The amount of preventable blindness in Palestine is thus considerable. Excellent graphs accompany the paper, and it is to be hoped that its publication has already led to some amelioration of blindness among the Jewish population of Palestine.

ABSTRACTS

I.—LENS

(1) **Wright, Robert E. (Madras).—"Some impressions derived from my experience of cataract work."** *The Irish Jl. of Med. Science*, Series 6, No. 94, p. 549, October, 1933.

(1) In the Montgomery Memorial Lecture, delivered at the Royal College of Surgeons in Ireland, on July 27, 1933, and reported in the *Irish Jl. of Med. Science*, Wright gives an account of his experiences of the operative treatment of cataract at the Government Ophthalmic Hospital, Madras, during the 12 years prior to March, 1932, amounting to 20,000 extractions. He discusses his views on the matter of surgical cleanliness of the field of operation and in his Indian practice prefers to rely upon the trial bandage test and Herbert's perchloride irrigation followed by painting the lid margins with a saturated solution of aqueous picric acid. An account is given of local anaesthesia and akinesia by blocking the temporo-facial division of the seventh cranial nerve, and of the ciliary block by retrobulbar novacaine and adrenaline injection. Such complications as orbital haemorrhage and paralysis of the inferior rectus attendant upon this latter procedure are mentioned. In the author's opinion a stitch in the superior rectus is not a solution to the problem of globe-rolling.

In the preliminary general preparation of the patient for operation a trial with opiates such as omnopon is advised to elicit any tendency of the patient to vomit after such drugs or an idiosyncrasy to them. A free use of sedatives in apparently large doses is recommended before and immediately after the operation. Before operation careful attention is paid to the treatment of respiratory affections, such as asthma, and hyperpiesis so as to minimise the effects of these disorders after operation.

The author discusses the intra-capsular extraction. He condemns the Smith operation on account of complications such as forward dislocation of the vitreous associated with impactions and iris displacements. He comments on changes such as condensation and liquefaction of the vitreous which may occur after intra-capsular extraction. In favour of intra-capsular extraction he states that when successfully performed "it gives an astounding freedom from reaction, an immediate return of iris function—early optimum visual function with a quiet, healthy eye."

The techniques of the Barraquer operation and the forceps extraction are discussed and compared.

Contra-indications for the intra-capsular operation are persons under 55 years of age; prominent or bulging globes, especially in fat plethoric patients; glaucoma; gaping of the wound after the Graefe section has been completed; and a shallow anterior chamber; high or even moderate myopia; and chronic anterior uveitis. Sub-luxated lenses, traumatic cataracts and many of the complicated cataracts with dense membranous capsules are unsuited to the Barraquer operation although the latter type, except Morgagnian cataracts are ideal for forceps extraction. After the extraction of the nucleus of a Morgagnian cataract the capsule can be removed complete with Kalt's forceps. The author comments that the most disappointing thing about intra-capsular extraction is the relative infrequency with which immature cataract can be removed without unjustifiable trauma on account of the resistance of a relatively strong zonule.

In the account of extra-capsular extraction the technique of irrigation is described at some length. Preliminary capsulotomy before making the Graefe section has been favoured at the Madras Hospital for over half a century, but the author feels that it might be improved upon. At present, in spite of trials with many instruments, he has not found an ideal method of removing a sufficiently large amount of anterior capsule free from tags that may float into the wound or become adherent to the cornea. The methods of making the section; the varieties of conjunctival flap; corneo-scleral sutures and the treatment of after cataract are discussed. In conclusion the author mentions certain preventive measures for cataract and among these he refers to the high incidence in Madras of cataract caused by the hook worm found in advanced ankylostomiasis.

H. B. STALLARD.

(2) **Grosz, Professor Emile de (Budapest). — Extraction of cataracts.** *Arch. of Ophthal.*, 1934.

(2) **Emile de Grosz** is entitled to speak with authority on this subject, since he estimates that of 14,000 operations for senile cataract performed in Budapest during the last 30 years some 10,000 were performed by himself. His instruments are sterilized by dry heat (half an hour at 130°C.) and his method of operating follows the German technique in which the surgeon stands at the side of the patient instead of behind his head. He employs capsule forceps and after expulsion of the lens the removal of remnants is carried out with the Graefe spoon, assisted by the Daviel's spoon. Discission of after-cataract was comparatively rarely needed, partially because the majority of the patients were satisfied with vision of 5/15 to 5/20. Latterly, the author has

been extracting the lens in its capsule using retro-orbital anaesthesia, akinesia, thread fixation and a special pair of capsule forceps. In the after-treatment, the eyes are bandaged for 24 hours, after which time the eye not operated upon is left open, the other being kept covered for four days. Six hours after operation the patient is allowed to sit up in an arm-chair for 12 hours. The patients are never kept in bed for more than 24 hours. The author's results are excellent. As an illustration of the efficacy of his methods, two individual instances are given :—Count Tisza, fought four duels with the sword after a cataract operation and wounded all his adversaries without sustaining any injury himself, and the other, Count Khuen Hedervary, who took part in a political banquet two weeks after his operation without feeling any unfavourable after effect.

F. A. W-N.

(3) **Appleman, Leighton F. (Philadelphia).—Intracapsular cataract extractions by the Knapp method.** *Arch. of Ophthal.*, June, 1933.

(3) **Appleman's** technique was as follows: With the pupil dilated by atropine the ordinary section was made and an iridectomy performed. Kalt's forceps was then used to grasp the lens capsule in its lower third. Slow traction was made upwards and from side to side, until the zonule was ruptured below and the lower edge of the lens came into view in the pupillary space and remained there. The forceps was then removed and the lens tumbled and expressed by pressure backwards at the lower limbus with a Smith hook, combined with pressure downwards on the scleral lip on the incision with a spoon or spatula. With regard to results, three patients developed retinal detachment, two had no improvement in vision because of irido-cyclitis and one was a foreigner for whom no interpreter could be obtained. Of the remaining 96, 67 per cent. obtained 6/12 vision or better, whereas in 63 patients in which the extracapsular operation was performed, 6/12 vision, or better, was obtained in 58·7 per cent. The author feels encouraged to continue using this type of operation.

F. A. W-N.

(4) **Alvis, B. Y. and Weiner, Meyer (St. Louis).—Very high astigmatism in keratoconus and post-cataract cases.** *Amer. Jl. of Ophthal.*, November, 1933.

(4) **Alvis** and **Meyer Weiner** describe seven cases of high astigmatism, five being due to keratoconus and two occurring after cataract extraction, corrected by cylinders varying from

8 to 30 D., which were worn with benefit to vision and with comfort.

The authors review the literature of this subject and describe their own methods of examination and the assistance they derive in these cases from information afforded by the ophthalmoscope, keratometer, and retinoscopy. Subjective testing requires infinite co-operation, patience and persistence for prolonged and repeated trials. The technique of this is described. When the visual acuity is no longer improved by a sphero-cylindrical combination, cylinders of opposite sign are placed at the opposite axis to that already in the trial frame and the authors have found this device of crossing cylinders useful. Case reports are given in detail showing the variations in the cylindrical and spherical corrections at examinations repeated throughout the course of several years.

H. B. STALLARD.

(5) **Bietti (Naples).—The changes of temperature of various regions of the eye produced by the local application of heat and cold. Its bearing on the production of cataract. (Ricerche sulle variazioni di temperatura di alcune zone del bulbo ocilare per diatermocoagulazione episclerali, termocauterizzaioni e criocausticazioni. Contributo allo studio dell' insorenza di una cataratta nelle operazioni contro il distacco retinico).** *Boll. d'Ocul.*, December, 1933.

(5) **Bietti** wished to see whether the use of diathermy to the sclera over the ora serrata caused any large rise of temperature in the lens. He finds that there is a definite rise at the equator and notes that in his experiments a cataract was occasionally seen but in almost all cases the opacity disappeared in a short time. By means of a thermo-electric needle he has measured the increase in various parts of the eye and finds it minimal, except in the region of the equator of the lens, where it may reach as much as 24°C., but generally is much less. As a result of these experiments he concludes that the cataract is due not to the direct heat but probably to some change in nutrition set up by changes in the ciliary body.

HAROLD GRIMSDALE.

(6) **Galeazzi (Rome). — Cataract and the calcium-potassium ratio. (Cataratta ed equilibrio calcio-potassico).** *Rass. Ital. d'Ottal.*, November, 1933.

(6) The cause of senile cataract is still quite unknown, though there are certain pointers which may eventually lead to a solution of the problem. There is no doubt that certain endocrine

disturbances tend to be followed by changes in the lens; and also occasional changes in the calcium metabolism. Tetany is the best known example of this connection; and this seems to be connected with alterations of the parathyroid. It is known that excision of the parathyroid is followed, in animals, by defective repair of bone; on the other hand some observers have noted that the administration of parathyroid preparations to young rabbits is followed by a great increase of calcium in the skeleton. These, and other similar facts, suggest that the appearance of cataract is in some way dependent on changes in the calcium metabolism.

Potassium and calcium salts are, to a large extent, mutually antagonistic in their actions on the tissues; thus, for example, calcium increases the strength of pulsation of an isolated frog's heart; potassium depresses its action. The presence of calcium favours the dissociation of hydrogen ions; potassium of the hydroxyl ions.

If there is a small change in the calcium-potassium ratio in the aqueous, this may alter the permeability of the lens capsule and thus make a change in the nutrition of the lens. **Galeazzi** has examined the calcium-potassium content in the serum of a number of patients suffering from cataract. He finds the substances present in amounts closely corresponding to the findings in normal healthy people; there is a small increase in the potassium, which he thinks deserves further examination. He hopes to be able to extend his researches to the analysis of the aqueous, but this, as he points out, has obvious difficulties.

HAROLD GRIMSDALE.

(7) **Cattaneo (Sassari).—Clinical and experimental observations on contusion cataracts. (Osservazioni cliniche e ricerche sperimentali su le cataratte da contusione).** *Annal. di Ottal.*, February and March, 1934.

(7) **Cattaneo** gives notes of 30 cases of cataract after contusion. He groups them under two headings, those with rupture of the anterior or posterior capsule and those with no obvious rupture. In the former class the cataract is due to the admission of the aqueous to the lens fibres; in the latter the cause is less obvious. The former are usually progressive and lead, except in the case of very small ruptures, to complete opacity; the latter are often temporary only and clear up leaving little trace. To understand the mechanism of these latter cases the author made a series of experiments on rabbits. He finds that within a few hours of the blow, opacities appear near the anterior suture of the lens; microscopical examination shows small areas immediately under

the epithelium filled with granular matter containing a few nuclei. These seem to be derived from the cells of the epithelium which are seen to show karyokinesis. After these initial opacities have cleared up, others may come on in the superficial layers of the cortex. Their position and shape probably vary with the force and direction of the injury.

It has been suggested that the opacity was due to actual contact of the cornea with the lens; the author has not been able to prove this; in one case he emptied the anterior chamber purposely before striking the cornea, and in this the results were different from those of the other experiments. A small rounded opacity appeared in the centre of the anterior region of the lens. In this case there could be no doubt that the force was transmitted to the lens directly through the cornea.

HAROLD GRIMSDALE.

(8) **Biffis and Quaglio (Padua).—Experiments with the antigen of the crystalline lens. (Ricerche sperimentali di antigenoterapia cristallinica).** *Ann. di Ottal.*, September, 1933.

(8) **Biffis** and **Quaglio** have made many experiments to discover whether the injection of lens proteins has any effect on the development or absorption of traumatic cataract. They have not been able to observe any difference of behaviour between the animals injected with the antigens and the control animals.

HAROLD GRIMSDALE.

(9) **Lo Cascio and Bertuzzo (Padua).—Spectrographic examination of the lens. (Ricerche spettrografiche sul cristallino).** *Ann. di Ottal.*, September, 1933.

(9) It is known that the lens is not absolutely colourless, but has a slightly yellow tint increasing with age. **Lo Cascio** and **Bertuzzo** find that the absorptive power of the lens for waves of short length varies in different species of animals; in animals such as the cat, which can see in the dark, the lens is specially transparent to the short waves. Since the lens is slightly fluorescent, and since the waves excited in fluorescence are almost always longer than the exciting waves, it is not easy to determine accurately the limit of visibility of the spectrum. To obtain accurate results it would be necessary to examine subjects who had had the lens removed. It is probable that in normal subjects the limit of visibility lies between wave-lengths of 3905 and 3714.

HAROLD GRIMSDALE.

II.—MISCELLANEOUS

(1) **Yudkin, Arthur M. and Gilman, Alfred (New Haven, Conn.). Osmotic equilibrium between blood and intra-ocular fluid as influenced by anisotonic injections.** *Arch. of Ophthal.*, October, 1933.

(1) **Yudkin** and **Gilman** making use of a new method to determine the osmotic pressures of small quantities of fluid, determined these pressures in the defibrinated blood and in the aqueous, of a series of dogs. In the normal animal they found that they were practically isotonic. Thirty minutes after intravenous injection of sodium chloride (5 c.c. of a 10 per cent. solution per kilo. of body weight) there was a definite rise in the osmotic pressures of the blood, but an almost parallel rise in that of the aqueous. When a hypotonic solution (distilled water) was intravenously injected there was a decrease in the osmotic pressures of the blood and aqueous. In each case the change in the aqueous was a little less in the blood, but the lag was greater with hypothan with hypertonic solutions. Results of the same character were obtained when sodium chloride or distilled water were given by stomach tube. The authors consider these data as showing that intravenous injection of hypertonic saline must be of only temporary value in cases of glaucoma since osmotic equilibrium is established in about 30 minutes and after this has occurred there are no forces acting to cause a further loss of fluid from the anterior chamber.

F. A. W-N.

(2) **Towbin, B. G., Protopopow, B. W. and Urnishewskaya, W. S. (N.-Novgorod).—On the effect of operative procedure on the intra-ocular pressure. (Ueber die Wirkung des operativen Eingriffes in eines der beiden Augen auf den intraocularen Druck des anderen Auges).** *Arch. f. Ophthal.*, Vol. CXXXI, p. 554.

(2) **Towbin** and his fellow-workers took regular morning and evening measurements of the intra-ocular pressure in the eyes of nearly 100 patients on whom operation was performed for a variety of diseases on the one eye, and in more than half of the cases they found an alteration in the usual curve of the tension in the non-operated eye, their clinical observations thus confirming the experimental results recorded in recent literature.

The authors found that in glaucoma the changes in the "sympathizing" eye showed a marked difference from those observed after all other operations; while in some cases the tension fell, the variations between the morning and evening readings

of the tension diminished and the vision improved, in others the reverse occurred.

These varying results would indicate that in some cases the non-operated eye is released by operation on the other from the reflex that, arising from the latter, would otherwise tend to affect the former; in other cases the operation on the one eye reacts on the other and upsets the balance of the complicated system regulating the intra-ocular pressure in the latter—which is more likely to occur in restless, nervous patients.

In all other types of disease for which operation was performed the effect on the eye amounted only to a temporary departure from the normal tension curve.

In a few of these cases, all restless during the operation, the tension in the other eye rose immediately after, and this rise is attributed to a reflex from the sensation of pain in the operated eye which brought about a vaso-motor change in the other.

In a large proportion of the cases, however, an initial fall in the tension was recorded, due, it is held, to the fall in the operated eye, and followed by a return to the normal with or without an intervening rise in the intra-ocular pressure.

THOMAS SNOWBALL.

(3) **Weekers, L. and Dautrebande, L. (Liège).—A study of the vaso-motor reactions of the retina by means of experimental hypertension. (Etude des réactions vaso-motrices de la rétine à l'hypertension expérimentale).** *Arch. d'Ophtal.*, December, 1933.

(3) "It is well-known how difficult it is at present to offer an opinion about the existence of vaso-motor arrangements in the brain. We have thought it worth while to investigate the retinal vaso-motor reactions in acute hypertension brought about by sudden (*brusque*) hypotension at the carotid sinus. We know as a matter of fact, since Hering, the rôle played by variations in the intra-sinus pressure in the regulation of general vaso-motor tonus. Every hypertension in this region causes somatic hypotension with bradycardia; every intra-carotid hypotension brings about somatic hypertension through peripheral vaso-constriction with tachycardia."

Weekers and **Dautrebande** have used ophthalmoscopic examination on narcotized dogs subjected to occlusion of both common carotids. They fully admit the difficulties involved in determining fine changes in the calibre of retinal vessels as the result of reflexes produced experimentally. In fact they admit the uncertainty of the method. But, they argue, that when the results of their examinations tend as a whole in certain directions they have a

definite value. One cannot here give the details either of the experimental method or of the individual results, but the authors' summary of results and conclusions may be given.

(1) Acute reflex hypertension caused by intra-sinus hypotension in the chloralosed dog is accompanied by circulatory changes in the retina. (2) These circulatory changes do not depend upon simple ischaemia but are brought about by a reflex mechanism the origin of which must be in the carotid sinus and the centrifugal arc of which passes through the cervical sympathetic. (3) These changes in most of the cases are characterized by vaso-constriction coming on at the highest point of the hypertension (graphs appear in the original which show this well). Although ophthalmoscopic examination may be subject to numerous criticisms, to us it seems hardly possible, as the result of our experiments, not to consider probable the existence of vaso-motors in the retina. (4) Non-anaesthetized dogs rendered chronically hypertensive, by section of the two nerves of Hering and the two nerves of Cyon, present retinal vascular changes comparable to those seen clinically in hypertensives (namely, as stated in the body of the article, vaso-constriction and pallor of the discs).

ERNEST THOMSON.

(4) **Federici (Naples).—The behaviour of the capillary "barrier" of the eye under various experimental conditions. (Ricerche sul comportamento della barriera emato-oftalmica in varie condizione sperimentali).** *Arch. di Ottal.*, July-August, 1933.

(4) Abnormal permeability of the ocular vessels has been suggested as the true explanation of the incidence of glaucoma. **Federici** has made a large series of experiments on animals to find out under what conditions the permeability of the capillaries is increased. He finds that the application of atropine (to which rabbits are very insensitive) and miotics (to which they are very sensitive) is followed in each case by an increase of the amount of diffusible substance in the aqueous. The application of adrenalin at first checked the flow, but later when the mydriasis passed off, the flow increased. Heat applied to the anterior segment of the eye, and injury, physical or chemical, also increased the permeability. The author concludes that anything which increases the congestion of the anterior segment of the eye, favours the passage of diffusible chemical bodies into the aqueous.

He has made a second series of experiments with "vital" colours, injecting these intravenously, he notes the occurrence of coloration of the conjunctiva and its modifications under the action of various excitements.

HAROLD GRIMSDALE.

(5) **Sala (Catania).—The relation between the cervical sympathetic and the retinal vaso-motor nerves in the dog. (Ricerche sperimentali sui rapporti tra simpatico cervicale e vasomotoriretinici nel cane).** *Rass. Ital. di Ottal.*, September-October, 1933.

(5) There is no doubt that the ocular vessels, like all the other vessels of the body, are under the control of the nervous system, but they seem to be less liable (as are the vessels of the brain, to which system the ocular vessels belong) to abrupt circulatory changes than vessels in other regions. **Sala** has experimented, removing the superior cervical ganglion on one side and observing the changes in the vessels on that side by the ophthalmoscope. He finds that immediately after the operation the vessels are constricted.

Atropine produces a dilatation of the vessels of the normal side but leaves those of the side operated on unaffected, adrenalin on the other hand causes constriction of both sides. He concludes that there are active vaso-dilating fibres supplied to the retinal vessels which are functionless after excision of the ganglion.

HAROLD GRIMSDALE.

(6) **Vele (Parma).—Observations on the capillaries of the limbus in some diseases of circulation. (La capillaroscopia dei vasi perilimbari nelle affezioni dell'apparato circolatorio).** *Boll. d'Ocul.*, October, 1933.

(6) **Vele** has examined the limbal capillaries by the slit-lamp in a number of patients suffering from cardiac and vascular lesions; and holds that the findings in many of these cases have not only a diagnostic, but also a prognostic importance. The description of the various conditions found cannot easily be condensed, for example, in the cases of arteriosclerosis the capillaries are said to be much longer than usual, sometimes passing the border of the cornea; they are markedly narrow and tortuous; the current is slowed often with occasional stasis; frequently there are punctiform haemorrhages, invisible to the naked eye. This, the author thinks must be regarded as of special interest as an indication of a similar state in other tissues where even a minute haemorrhage may be of grave importance.

HAROLD GRIMSDALE.

(7) **Greenfield, J. G. and Nevin, S.—Amaurotic family idiocy: study of a late infantile case.** *Trans. Ophthal. Soc. U.K.*, Vol. LIII, p. 170, 1933.

(7) **Greenfield** and **Nevin** have made an interesting contribution to the literature of amaurotic family idiocy. They describe the clinical features and pathology of the late infantile type of this

disease occurring in a female child, aged 2 years and 10 months, born of healthy English parents, with no history of intermarriage with Jews and no consanguinity. A large dull red spot surrounded by a greyish opaque area was present at the macula in each eye. The child became unable to walk or speak, became blind, mentally deficient and died of intercurrent disease at the age of 2 years and 11 months.

The post-mortem findings are described in great detail and it is evident that the authors have taken considerable trouble in making very complete histological examinations of the central nervous system, using a number of staining reagents for lipoid and Nissl granules and many solvents in attempts to determine the histochemical reactions of the lipoid in the nerve cells.

The brain sulci were wider than normal and some firmness and shrinkage of the optic thalamus on its ventricular aspect was discovered.

The large cells of the cerebral cortex were swollen, pear-shaped, round or oval with the nucleus displaced to the side or to the poles of the cell, and rarely occupying its centre. The cytoplasm was devoid of Nissl granules, but contained lipoid.

Lipoid swellings were observed on the dendrites of certain of the pyramidal cells of the hippocampus, the large cells of the claustrum and the Purkinje cells of the cerebellum.

The cells of the putamen and caudate nucleus were devoid of Nissl substance and contained lipoid in a few of the larger cells. A clear peri-nuclear zone of protoplasm was present in these cells.

The large cells of the globus pallidus contained residual Nissl substance around the nucleus and were uniformly filled with yellow staining lipoid. All the cells of the thalamus contained lipoid and Nissl substance was absent. The substantia nigra was the least affected part of the central nervous system and retained Nissl granules in the cytoplasm of the cells.

The motor nuclei of the brain stem and spinal cord were round and swollen and contained lipoid, and the nuclei of these cells were displaced and surrounded by a zone of fine Nissl granules. The lateral oculo-motor nuclei were less swollen, retained their shape and had Nissl granules throughout the cell body. The large motor nuclei of cranial nerves 5, 6, 7, 10 and 12 were swollen and some showed dendritic lipoid swellings and there was a tendency for the lipoid to extend into the bases of the dendrites.

In the cerebellum the Purkinje cells were irregular in size, shape and spacing, the nuclei were shrunken and surrounded by a zone of Nissl granules, the rest of the cytoplasm containing lipoid. Neurofibrils were absent in the most degenerated cells. The dentate and roof nuclei also showed lipoid degeneration.

In the posterior root ganglia Nissl substance was scattered throughout the cell whereas in the sympathetic ganglia there was only a trace of it around the nucleus of the cell. Lipoid degeneration was present in the cells of the ganglia. The medullated fibres of the striae Gennari were well marked, but elsewhere the tangential fibres only lightly stained.

Diffuse neuroglial overgrowth was present in the occipital lobes, the hippocampus, thalamus, mammillary bodies, corpus striatum and the septa of the lateral columns of the spinal cord.

In the retina the ganglion cells were swollen, round or oval. The nuclei were irregular, pyknotic and displaced to one side. Lipoid filled the cytoplasm of the affected cells except in a few instances where vacuoles were present at the poles. The remainder of the retina showed no change. It was of normal thickness and no oedema was detected.

The authors give a full account of the staining properties of the lipoid with alum-haematoxylin, Kultschitzky's haematoxylin, Weigert's haematoxylin, iron haematoxylin, Scharlach R, Sudan III, and Nile blue. Also they have made a detailed investigation of the solubility of lipoid in such solvents as alcohol, acetone, ether, xylol, pyridin, chloroform, acid alcohol and ether, and methyl alcohol and chloroform.

The literature on amaurotic family idiocy is reviewed and commented upon, and the retinal changes discussed.

H. B. STALLARD.

(8) **Mitter, S. N. (Delhi).—A case of bilateral macular disease in a child.** *Indian Med. Gaz.*, January, 1934.

(8) **Mitter** comments on the bilateral macular lesions that occur in children, probably inflammatory in nature and of toxaemic origin, appearing after the acute exanthemata, typhoid and other infectious diseases. He describes the case of a boy, aged 9 years, the subject of congenital icthyosis, who presented oedematous and pigmentary changes at the maculae. A rapid recovery in three weeks led to the restoration of vision from counting fingers at 10 feet in the right eye and at 8 feet in the left eye to 6/9 partly with each eye. Some fine pigment deposits persisted at the maculae. The author in his commentary of this case quotes Porter's statement that 70 per cent. of children affected with congenital icthyosis have a subnormal basal metabolic rate suggestive of hypothyroidism. The author suggests that faulty metabolism may have resulted in a mild toxaemia and altered the permeability of the capillaries in the vicinity of the maculae.

H. B. STALLARD.

(9) **Giannantoni and Possenti (Perugia).—Ocular symptoms in pulmonary tuberculosis. (Sintome oculari nella tubercolosi polmonare).** *Ann. di Ottal.*, November, 1933.

(9) It is not generally recognized how frequent are the ocular symptoms in tuberculosis of the lungs. Many authors have drawn attention to various manifestations in the eyes of tuberculous patients. This paper is the record of the examination of 150 subjects of pulmonary tuberculosis. Apart from the condition of the lashes, which **Giannantoni** and **Possenti** found almost constantly increased in number and length, they have observed changes in the width of the palpebral fissure; the fissure on the side of the affected lung being wider in 64 per cent. of the cases. Inequality of the pupils, was found in almost 50 per cent.; and more frequently with the gravity of the infection. In two-thirds of the cases in which there was no obvious inequality of the pupils, differences were found in the behaviour to mydriatics. Sergent's test (measurement of the time of recovery of action after mydriasis) showed in 86 per cent. a marked prolongation of the time necessary for recovery varying with the state of the lung. These changes in the pupil reflexes, point to some latent derangement of the nerves which govern the movements of the iris.

HAROLD GRIMSDALE.

(10) **Hoeve, J. van der (Leyden). — Scleromalacia perforans.** *Arch. of Ophthal.*, January, 1934.

(10) There are many diseases of the cornea, so many in fact, that although the chapter on this subject in the Graefe-Saemisch Handbuch was started 35 years ago, it has not yet been printed. The sclera, however, has relatively few diseases and it is, therefore, a little surprising that scleromalacia perforans should have escaped detection up to date. The disease "has as its principal symptom, the appearance of holes in the sclera which can coalesce so that the sclera shows large gaps in which the uvea lies either covered by conjunctiva or bare." In this disease, inflammation plays no rôle, or at least a very secondary one, the process being mainly degenerative. **van der Hoeve** saw his first case in 1928, in a woman, aged 55 years, who was crippled with rheumatic poly-arthritis. There were several holes in the sclera containing uveal tissue which in some places was covered by conjunctiva and in others was bare. Vision in one eye was perception of light and in the other 1/300. Professor Rochat had had a similar case in 1925 and another in 1932. The fourth case described in this paper is one of the author's which differed from the preceding three

in the absence of polyarthritis, the occurrence of the holes in the intercalary region of the sclera and the preservation of relatively good visual acuity. Now that scleromalacia perforans has been described, other cases will probably be published, but there seems little doubt that the credit for establishing this condition as a definite entity is to be given to van der Hoeve.

F. A. W-N.

(11) **Urbanek, Joseph (Vienna).—On fat embolism in the eye. (Ueber Fettembolie des Auges).** *Arch. f. Ophthal.*, Vol. CXXXI, p. 147.

(11) In this communication **Urbanek** gives details of a series of cases of fat embolism in the eye following severe injury. In three of these he confirmed his observations by microscopical examination.

These cases all occurred after fracture of long or flat bones, in some the symptoms of fat embolism supervened after the setting of the fracture.

Ophthalmoscopic changes were not observed before the third day after the accident, and took the form of small haemorrhages and white spots on the retina, resembling diabetic retinitis; the haemorrhages usually preceded the appearance of the white spots, which developed at the bifurcation of the vessels in close proximity to the haemorrhages. Where the cases could be observed for some time it was found that the first batch of haemorrhages and white spots disappeared, and others developed at other points in the retina and again disappeared.

From the results of the anatomical examination the author draws the conclusion that the fat emboli are to be found much earlier in the posterior half of the eyeball than in the anterior, and more frequently in the choroid than in the optic nerve or retina.

The vision and fields may or may not be affected; in the absence of disturbance of vision these changes in the retina may readily be missed.

The author comments on the paucity of reports of eye changes in fat embolism, considering the large general literature on the subject, and concludes that this is due not to the fact that they have been overlooked, but that their true significance has not been recognized. Among other cases that have been so recorded he would include Eales' case of "supposed unilateral albuminuric retinitis" (*Trans. Ophthal. Soc. U.K.*, Vol. 5) and Purtscher's "Angiopathia retinae traumatica" as examples of fat embolism in the retina.

THOMAS SNOWBALL.

12) **Benedict, William (Rochester, Minn.).—Removal of orbital tumours.** *Surg. Gyn. and Obstet.*, February, 1934.

(12) **Benedict's** article opens with the caution that surgeons operating upon tumours within the orbit must be familiar with the regions adjacent to it, and be prepared to cope with unexpected complications outside their usual field of operation. For these reasons he advises the ophthalmologist to work in conjunction with a rhinologist or a neurological surgeon. Examples of this are afforded in the removal of an orbital osteoma whose superior surface may have eroded the roof of the orbit and be adherent to the dura, or in the removal of a more vascular tumour when it may be necessary to ligate the internal carotid artery to control haemorrhage. There are three areas which are concerned in planning surgical procedures. The first is the potential space between the periorbita and the orbital wall. This is reached by an incision through the skin from the supra-orbital notch to the temporal side of the orbit, parallel to its upper margin. The periosteum can then be stripped off the bone and the orbital contents depressed sufficiently to leave room for surgical manipulations. The second space is that between the periorbita and the cone of muscles. More than three-fourths of the tumours in this region can be reached through the skin incision already described after division of the periorbita in a radial (antero-posterior) direction. The third space is that within the muscle cone. Here, again, the sub-periorbital route may give adequate access, though external canthotomy, division of the conjunctiva and displacement of the globe to the inner side may be more satisfactory in some cases. Krönlein's operation is seldom employed for any region of the orbit other than the posterior third. Internal canthotomy should be avoided whenever possible on account of danger of interference with the lacrymal duct and the lower lid should not be incised because of the risk of subsequent cicatrization and ectropion. These operations are best performed under general anaesthesia because infiltration of the orbital tissues adds to their difficulty and because the scope of the operation may have to be extended beyond the bounds originally thought necessary.

F. A. W-N.

(13) **François, Jules (Charleroi).—Inflammatory ectropion and its treatment by total tarso-conjunctival excision.** (**L'ectropion inflammatoire et son traitement par l'excision tarso-conjonctivale totale**). *Arch. d'Ophtal.*, December, 1933.

(13) **François** classifies the varieties of ectropion as follows, *viz.*, (1) cicatricial; (2) paralytic; (3) spasmodic; (4) senile; and he adds (5) inflammatory as a fifth type. This fifth type has

been classified by others as coming under the types called senile, paralytic or non-cicatricial indifferently. The author thinks it should be separated from the others. After comparing and contrasting it with the others he gives the definition that its characteristic is "tarso-conjunctival thickening secondary to inflammation of the inferior tarso-conjunctiva." The operation which he has found successful consists in complete excision of the whole ectropioned conjunctival surface and of the underlying tarsus. The method of operation is described and illustrated.

ERNEST THOMSON.

(14) **Beaumont, J. H. (New Zealand).—Modern treatment of strabismus.** *New Zealand Med. Jl.*, June, 1933.

(14) **Beaumont** gives a brief survey of the theories concerning the aetiology of strabismus, but does not discuss these. He describes the synoptophore and its practical application and states the advantages that this instrument possesses over the amblyoscope and cheiroscope in enabling the surgeon or orthoptic trainer to make objective observations instead of relying upon subjective information from the patient. He describes the sequence of events in a case of squint. Three tables are shown in the text exhibiting clinical data of (1) a group of cases treated by operation and then orthoptic training; (2) cases treated by orthoptic training without surgical intervention, and (3) a group of cases which proved unsuitable for orthoptic treatment on account of a well-established false macula, amblyopia of long standing, aphakia, mental dullness and other factors.

H. B. STALLARD.

(15) **Barrett, Sir James (Melbourne).—Causes of blindness.** *The Med. Jl. of Australia*, December 30, 1933.

(15) At the Australasian Medical Congress in 1923, **Barrett** presented the results of an analysis of 192 applications for admission to the Royal Victorian Institute for the Blind for the period 1901-1923. The present paper is an analysis of such patients during the last 10 years.

The total of 226 is analysed in two tables; one of 94 cases under 15 years of age, the second of 132 over that age. In each, myopia and optic atrophy show the largest figures.

By comparison with the first series, trachoma is shown to be a far less common factor in the younger cases, bearing out the fact that the disease is rapidly disappearing in Australians. Ophthalmia neonatorum is another declining cause of admission, but myopia and retinitis pigmentosa have increased.

The figure of 50 per cent., given in 1923 as the percentage

caused by venereal disease, can now be lowered to nearer 40 per cent., and if venereal disease were eliminated at least 30 per cent. of the cases would not exist.

The numerous cases of myopia and the cases of retinitis pigmentosa open up the eugenic problem in an acute form.

R. C. DAVENPORT.

BOOK NOTICES

Leccionnes de Oftalmología Clinica. By MANUEL MÁRQUEZ. Second edition, pp. 458, illustrations, 465. Madrid. 1933-4.

This is the second and amplified edition of Professor Márquez' text book which appeared in 1928. The book remains substantially the same with the addition of some further diagrams and coloured plates and a new chapter on the binocular field of vision. It is a most excellent, clearly written and comprehensive text book. It aims at catering primarily for the student who at the outset is completely ignorant of his subject, but in spite of this it is sufficiently full to serve as a book of reference for the more advanced practitioner. It begins with a short historical note on the growth of modern ophthalmology and thence passes to the examination of the eye, each chapter of the book being devoted to a stage in the clinical examination and the various conditions which it may reveal. The examination is of the most detailed, including the use of the slit-lamp, the gonioscope, fundus photography and radiography. The illustrations are excellent and the book written in a most lucid and interesting style.

Seeing and Human Welfare. By MATTHEW LUCKIESH, D.Sc. Pp. 190, illustrations, 5. Baltimore: The Williams and Wilkins Company. 1934. Price, 2.50 dollars.

In this book the author sets out to draw attention to the damage to human eyesight and economic loss by the toleration of bad lighting of workrooms, schools, factories and homes. He describes the physical and psychological factors involved in visual tasks and illustrates "the futility and injustice of judging seeing conditions by the rate at which productive work is done." He comments on the fact that fatigue is a very difficult effect to measure.

Chapters are devoted to the "Science of Seeing;" eye defects of age and usage; light and lighting; and the human seeing machine at work.

The author has spread himself in saying what he has to say, much of which could have been compressed without the loss of

information of value. Some of the experiments, particularly those in connection with registering nervous tension under various lighting conditions, are in the reviewer's opinion open to fallacies and errors.

The book will be of interest to industrial welfare workers, architects and decorators of house interiors as well as ophthalmologists.

External Diseases of the Eye. By DONALD T. ATKINSON, M.D. Pp. 674, illustrations, 479. London: Henry Kimpton. 1934. Price, 35s.

For the general practitioner and student this book contains much information that will be of value in the diagnosis and treatment of diseases affecting the anterior segment of the eye. The author is in agreement with Fuchs' "Textbook of Ophthalmology" in claiming that such disorders are more frequently seen than others and can be diagnosed without expensive instruments which are difficult to handle.

To the specialist the book is disappointing, because, except for the information on fungus diseases and the study of yaws and leprosy, it contains ordinary textbook information which in some subjects is too brief for a work of this size. Some of the author's views about operative technique would not receive universal acceptance in this country. Many of the illustrations and photographs are good, but some are poor and fail to illustrate clearly the clinical or operative feature the author intends to show. This is particularly in evidence in a few touched-up photographs and drawings which are made too small to be of practical value.

A good list of references is given at the end of each section. Chapters are devoted to diseases of the lids, lacrymal apparatus, orbit, conjunctiva, cornea, sclera, iris and ciliary body. The author has also included chapters on glaucoma, diseases of the lens, the extra-ocular muscles and the hygiene of the eyes. He has stressed the importance of the ophthalmologist familiarizing himself with nose and throat methods of examination and diagnosis, and has devoted some space to accounts of disorders of the nose and throat which may effect the eyes. In Chapter 14 he gives some useful notes on history taking and the keeping of case records, and the final chapter is devoted to an account of the remedies used in the treatment of external diseases of the eye. The book is well produced and the author has taken great pains and trouble in the reproduction of wax models and casts of certain pathological disorders of the lids and orbit. The reviewer's impression is that this book on the whole will appeal more to the general practitioner and student than to the well-established ophthalmic surgeon who will not find in it a uniformity of profound reading.

OBITUARY

BERNARD CRIDLAND

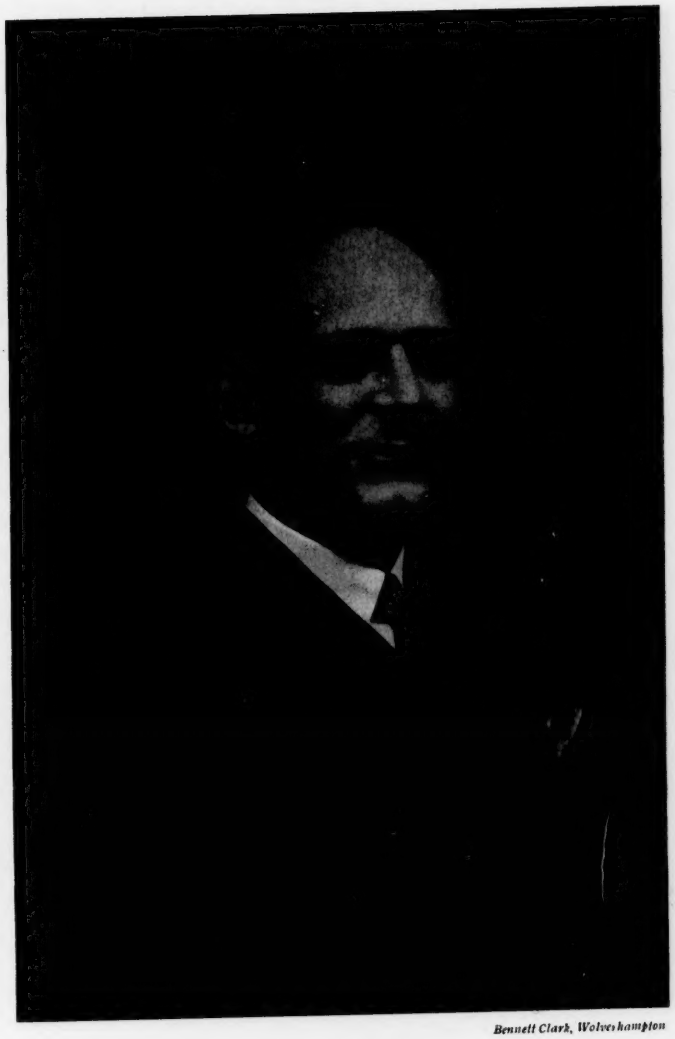
IT is with great regret that we record the death of Bernard Cridland, which occurred at his home in Wolverhampton on June 29. Those of us who were present at the opening of the Congress of the Ophthalmological Society of the United Kingdom in April, and heard his kindly reference to the President's illness as he took the Chair in his capacity of Vice-President, can have had no premonition that the speaker himself was so shortly to be overtaken by death. This is a very heavy blow to British Ophthalmology, and particularly so to the Oxford Congress and the Midland Ophthalmological Society. He was one of the best known and most popular of the provincial members of the fraternity, and his place will be hard to fill indeed.

Born in Bristol in 1873, Arthur Bernard Cridland was educated at Clifton, University College, London, and St. Mary's Hospital. He qualified at the Conjoint Board in 1898 and took the F.R.C.S. Edin. in 1903. After qualification he returned to Bristol as House Surgeon to the Eye Infirmary and, on completion of this service, he became anaesthetist with charge of the ophthalmic wards in the Bristol Royal Infirmary. Here he came under the influence of Richardson Cross, for whom he entertained a marked veneration, and of whose obituary notice in the *Brit. Med. Jl.* he was the author. In the South African war he served as civil surgeon, and, settling in Wolverhampton, he rapidly made his mark as an ophthalmic surgeon. He was appointed Ophthalmic Surgeon to the Royal Hospital, to the Wolverhampton and Midland Counties Eye Infirmary and to the Staffordshire General Infirmary.

It was at the Wolverhampton and Midland Counties Eye Infirmary that Cridland's chief work was done. During his active connection with the Institution the number of patients attending increased enormously. He was also responsible for the plans to enlarge the buildings and had the satisfaction of seeing the new operating theatre opened some years ago by his old teacher, Richardson Cross.

In his work in a large manufacturing centre he became recognized as an authority on injuries to the eye, of which he acquired a vast experience.

Proceeding D.O. Oxon. in 1910, he succeeded Sydney Stephenson as Hon. Secretary of the Oxford Congress. This post he held for 14 years and it is not too much to say that the unvarying success of this annual meeting was, in large part, due to Cridland's methodical work and personal charm of manner. He was Master



Bennett Clark, Wolverhampton

BERNARD CRIDLAND—1873-1934

of the Congress from 1929 to 1931, and delivered the Doyne Memorial Lecture last year. In this lecture he gave his experience of the after results of intra-ocular foreign bodies, a subject on which he could speak with authority. Cridland won the Middlemore Prize in 1918, his subject being "Eczematous Kerato-Conjunctivitis;" and his lecture was published in our columns.

Besides all this he was an active member and Past President of the Midland Ophthalmological Society and a Vice-President of the Council of British Ophthalmologists. During the past few years his position became enhanced by election as the representative of Great Britain on the International Council of the Association for the Prevention of Blindness. He was a regular attendant at the meetings of the Association and contributed to our pages unsigned précis of the deliberations. The last official work he did was to attend a meeting of this Council in Paris in May, his account of which will appear in our next number.

He was also a very hard working member of the Prevention of Blindness Committee instituted under the aegis of the Ministry of Health by the Union of Counties Association for the Blind.

Cridland was also a very keen member of the Ophthalmological Society. He joined in 1904 and was on the Council from 1918 to 1921, and sporadically since that date as *ex officio* a member in connection with the affiliated societies. Last year he was elected Vice-President.

Most of his contributions to the literature are recorded in the Transactions. Since 1916 hardly a year has passed without some contribution from his pen, so that 60 items stand to his credit in the Indices.

He was a member of the General Committee of the British Journal of Ophthalmology from the start in 1917, and contributed some papers to our earlier volumes, one of these was notable in recording cases of cataract in Puddlers. Cridland did much to popularize the use of the tonometer in clinical work.

Whatever he did Cridland put his whole heart into the doing. It was the same in his work as in his hours of recreation, as a keen fisherman, golfer and motorist. His friends were many, and they will like to remember his geniality, his capacity for making friends and the trouble he would always take to serve a friend in any way. Certainly the world in general and the ophthalmic circle in particular are so much the poorer for his having left it. His memory will always be cherished, not only in Wolverhampton, but by all with whom he came in contact, as that of a staunch friend who always played the game.

Much sympathy will be felt for his widow and children in their bereavement.

NOTES

Corrigendum

IN BASIL GRAVES' paper on p. 340, in the 12th line of brevier type the words "running south to the limbus," should read "running south to the fornix."

The final printing of Fig. 16, facing p. 313, discloses a defect in the block, which was not present when the proofs were printed, in the small area approximately between the letters "N" and "O." Below the head of the arrow, on the reader's left of the letter "N," the short isolated line should be joined up with the vessel coming down below the tail of the arrow and the two should be of similar thickness (the extreme thinness of the latter being also an error of reproduction). The reader's right-hand end of the short line below the letter "N" should be joined up with the short projection occurring just on the left of the letters "sd′," and the vessel which is defectively represented by this projection should then sweep down south, as represented, but without any constriction such as erroneously occurs shortly above the point where the vessel sd′ joins it. The correct representation will then be of two vessels N and O of equal diameter which run westwards parallel and in close proximity, to curve round southwards in a sharp bend and unite to form the big vessel M approximately where the vessel sd′ joins. This error is easily corrected in the figures with ordinary ink and a fine mapping pen, it being understood that the vessels N and O should be kept just distinct (for diagrammatic purposes) and not allowed to blend until they reach the point of junction with sd′.

Two slight errors have occurred in the printing of Fig. 22: in the portion of the loop included between the letters VC and VB there is an erroneous thickening of the vessel VB so that mid-way between these letters a small cross-communication, which should not be present, appears to join the afferent and efferent vessels; in the lower part of this figure the continuity of the fine arterial vessel LMN is unintentionally broken at M. On p. 315, at the beginning of the second footnote, the words "There figures" should read "These figures." On p. 321, fourteenth line up from the bottom, "than an explanation" should read "that an explanation." On p. 377 in the last line of the top paragraph "to" should read "of."

After perusal of the article the author feels that the following modifications are desirable in the interest of accuracy: on p. 307, line 8, the word "lower" should be substituted by "peripheral." On p. 317, line 15, the words "a subtrabecular course" should be "a noteworthy relationship with the trabeculae." Near the bottom of p. 317 the words "through a mountain" would better be "beneath a stretch of land." On p. 321, line 19, the words "much as an aneurysm may erode a bone" would be better deleted: this simile is, on reflection, not appropriate. On

p. 334, line 18, the words "character of" should read "character, primarily, of." Page 335, line 8, "exist" should be "exists." Page 338, line 34, "many of" should be inserted between the words "conjunctiva, the." Page 369, line 13, the words "double or" should be inserted before "treble." On p. 378, line 14, "which corresponds" should read "which very nearly corresponds." On p. 384, the whole sentence beginning "Quite rarely" could more suitably be placed at the end of the paragraph, after the word "iris."

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The International Organization in the struggle against Trachoma

THE Executive Committee met in May, 1934, in Paris. Members present included the President and General Secretary with Doctors MacCallan, Marquez, Morax, Park Lewis, Szymansky, Brandes, de Lapersonne, van der Hoeve, Wagenmann, Mazini Bey, Trantas, Marin Amat, Carris and Churchill.

In spite of limited resources it has been decided to make a grant for research in the aetiology of trachoma; and a sub-committee composed of Morax, MacCallan, and Wibaut were elected to give effect to this.

In 1935 a meeting is booked at Budapest when a discussion will be held on prophylaxis. The *rapporteurs* will be Myashita (Japan), MacCallan, Zachert (Poland), Tewfic and Jitta (Holland).

In May of this year a sitting was held in Paris in conjunction with the International Association for the Prevention of Blindness. The Presidents were de Lapersonne and de Grósz. The principal subject of discussion was trachoma in the Colonies and middle zone of Europe.

FUTURE ARRANGEMENTS

1934

October 2.—Midland Ophthalmological Society, at Birmingham. (Annual Meeting)

October 19.—North of England Ophthalmological Society, at Manchester.

November 16.—North of England Ophthalmological Society, at Bradford.

December 7.—North of England Ophthalmological Society, at Leeds.

1935

February 15.—North of England Ophthalmological Society, at Newcastle-on-Tyne.

March 15.—North of England Ophthalmological Society, at Liverpool.

April 12.—North of England Ophthalmological Society, at Sheffield.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *June, 1934.*

HOLLOWAY. The ocular findings in a series of intra-cranial fibroblastomata.
JACKSON. Practical trial lenses and a trial set.
BRUNER. Malingering tests.
GRADLE. Intra-capsular versus extra-capsular extraction of cataract.
KRAUSE. The chemistry of the lens. IV. The nature of the lenticular proteins.
ROY. Voluminous orbito-cranial osteoma, consequent cerebral abscess of nasal origin.
HOSFORD and HICKS. Causes of reactions following O'Connor cinch shortening operation.
ATKINSON. Extra-capsular cataract extraction combined with posterior capsulotomy.

Annales d'Oculistique. *June, 1934.*

DROUET, JEANDELIZE and GAULT. Study on the modifications of the visual fields in the hyperthyroid and para-Basedow syndromes.
ORTIZ. A new clinical form of the nasal nerve syndrome.
CORNET. Xerosis in the eye clinic. A new local treatment.
VIALLEFONT and LAFON. Diencephalomesencephalic origin of the ocular signs of Basedow's disease.
SUBILEAU. Squint operation by the myocampter procedure.

Archives d'Ophtalmologie. *May, 1934.*

DEJEAN. True glioma of the retina.
DEDIMOS. Pathogenesis and treatment of spring catarrh.
FRANCOIS. Catamenial conjunctivitis. Ocular affections taking place at the normal menstrual period.
NORDMANN. The actual facts of the cataract problem.

June, 1934.

TSCHERNING. Photometric glasses.
VASSILIADIS. Cancer of the globe and its treatment.
HUDELO and HERMANN. Epithelial invasion of the anterior chamber.
DOLLFUS and Halbron. Contribution to the study of the prognosis of penetrating wounds of the globe.

Lettura Oftalmologica. *April, 1934.*

TREMATORE. The alkalescence of the blood in glaucoma.
MARCHESINI. Some considerations on the pathogenesis of ocular tetanus.
CANITANO. The sterilization of the eye in relation to the suppurating agents.

May, 1934.

ALIQUO-MAZZEI. Unilateral Argyll Robertson sign following cranial trauma.
SANGUINETTI. Clinical and statistical considerations on primary glaucoma.

Archivos de Oftalmologia Hispano-Americanos. *June, 1934.*

FILATOW. New methods in the fight against expulsive haemorrhage.
KRAUSE. Chemical composition of the mucus and of the gelatine of the choroid and of the iris.
LLORCA. Telangiectatic form of sympathetic ophthalmitis.

Revista Oto-Neuro-Oftalmologica y de Cirurgia Neurologica.

July, 1934.

PAVIA. Macular degeneration.
DUBOIS. The exudative retinitis of arterial hypertension.